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DUCASSE (G.). **Note sur la ponte de *Dioryctria splendidella* H. S.**—*Rev. Zool. agric.* **39** no. 5–6 pp. 45–48. Bordeaux, 1940.

Various methods of inducing *Dioryctria splendidella*, H.-S., to oviposit in captivity were tried in south-western France, as eggs had not been found in nature. Experiments in which the moths were enclosed with small pine trees or shoots were unsuccessful, although in one experiment a few eggs were found on the sweetened water provided in a dish as food for the moths, but oviposition occurred several times when moths were enclosed in cloth sleeves on smooth bark of two 18-year-old pines. The bark had been made smoother by scraping in order to facilitate search for the eggs, and they were laid singly on the smooth surface or in crevices in it. The eggs are briefly described. About 20 were obtained, but only one hatched. The incubation period was 15–20 days. The moths are active at dusk and probably oviposit at nightfall.

LESPÈS (L.) & JOURDAN (M. L.). **Observations sur la biologie de la sésamie du maïs (*Sesamia vuteria* Stoll) au Maroc.**—*Rev. Zool. agric.* **39** no. 7–8 pp. 49–58, 2 figs., 4 refs. Bordeaux, 1940.

Sesamia vuteria, Stoll, greatly reduces the yield of maize and sorghum in certain parts of Morocco, the injury to maize being so severe that some growers have ceased to cultivate it. Details are given of the durations of the various stages and the larval instars of this Noctuid, as observed throughout the year under field conditions and in the laboratory. The shortest durations of the egg, larval, prepupal and pupal stages were 5, 22, 2 and 6 days, and the longest were 26, 118, 13 and 58 days. The durations varied with the season, but also varied considerably in a given month, and all extremes except the longest prepupal and shortest pupal stage were observed under field conditions. Larvae that developed in spring and summer had seven instars and those that completed their development in January had eight; the measurements of the head capsules are given in a table. Adult life usually lasted about a week and never exceeded ten days. Four successive generations were reared in the open between February 1939 and March 1940; from first oviposition to last emergence, they lasted, respectively, from February to June, May to August, August to October, and September to March, except that some larvae of the third generation entered a period of retarded development at the end of August and gave rise to adults in February. Larval activity in winter depended largely on diet. When green food, which is not available in the field, was provided, activity was considerable. In the Gharb region, the first generation develops on barley, wheat and oats and only the following ones on maize and sorghum [*R.A.E.*, A **26** 500]. Cotton bolls are occasionally infested late in the season, when larvae of the fourth generation were observed to complete their development on them. Females that oviposited in captivity always laid 700–800 eggs, though the number of batches deposited by them varied from three to nine; egg batches found in nature, however, contained only 20–50 eggs. They are deposited under the leaf-sheath at the first to third nodes. The larvae feed on the green tissue of different parts of the plant and occasionally on the flowers and milky grain. They usually enter the hollow stalk and travel downwards during the first and second instars, upwards during the third to fifth, and then downwards again. Larvae of all instars can move considerable distances over the ground from one plant to another. In some graminaceous plants, particularly sorghum, gelatinous matter collects at the point where the larvae enter the stem and also inside it, and many larvae become caught in it and die. This may explain why sorghum is less severely infested than maize. Pupation usually takes place in the stem, but occasionally in other parts of maize plants.

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FEYTAUD (J.) & DE LAPPARENT (P.). **Sur le dosage des poudres roténonées : doses maximum et minimum de racine.**—*Rev. Zool. agric.* **39** nos. 9–12 pp. 65–80, 89–91, 4 graphs, 6 refs. Bordeaux, 1940.

Detailed results are given of 78 laboratory tests carried out to ascertain the proportion of rotenone-bearing dust to carrier that gives the best and most economical insecticidal effect. The dust was cubé containing 6 per cent. rotenone, the carrier was talc, and the test insects were fourth-instar larvae of *Leptinotarsa decemlineata*, Say [*cf. R.A.E.*, A **28** 530]. It is concluded from the first series of 63 tests, which were designed to determine the maximum concentration desirable for practical work, that 30 per cent. cubé is equal to the undiluted powder, 25 per cent. is nearly always so, and 15 per cent. gives results sufficiently near it to be regarded as the maximum practical concentration. Dusts containing 10 per cent. cubé or less were appreciably less toxic. The 15 tests made to determine the minimum practical dose showed that while a dust containing 1 per cent. cubé was active, dusts containing less than 3 per cent. should not be used in practice, and a minimum of 5 per cent. is advisable. At 27°C. [80·6°F.], all larvae died in 203 and 104 minutes after treatment with 5 and 15 per cent. dusts, respectively.

The cubé was compared in 18 further tests with a good sample of derris containing 4·7 per cent. rotenone; both were used undiluted and at concentrations of 15 and 10 per cent. in talc and their effectiveness was found to be equal. Nearly all the rotenone dusts sold in France have a rotenone content between the limits of desirability indicated by the experiments recorded in this paper. The various factors that should be taken into consideration in choosing the strength of dust to use in a given case are discussed. They are the amount of active ingredient in the root, the fineness of the ground root and the diluent, the density of the diluent, the susceptibility of the insect, the dosage applied and atmospheric conditions.

BRIMBLECOMBE (A. R.). **The Biology, economic Importance and Control of the Pine Bark Weevil, *Aesiotes notabilis* Pasc.**—*Qd J. agric. Sci.* **2** no. 1 pp. 1–88, 36 figs., 15 refs. Brisbane, 1945.

The following is based largely on the author's introduction, summary and conclusions. *Aesiotes notabilis*, Pasc., occurs in the Australian tropical and sub-tropical rain forests of which its natural food-plants, species of *Araucaria* and *Agathis*, are components, and is now common in extensive plantations of the hoop pine, *Araucaria cunninghami*, which has received silvicultural attention for reforestation in Queensland. By 1936, the trees had reached a stage that rendered pruning necessary over extensive areas, but the removal of the lower green branches was followed by insect attacks sufficiently serious to threaten the welfare of established plantations. *Aesiotes* was the principal insect concerned, and attempts were therefore made to evolve a satisfactory means of preventing the attacks of this weevil on pruned trees.

It was found that the adults may live for 18 months or more and can continue to oviposit for the greater part of this period. The greatest number of eggs laid by a single female in the laboratory was 749. Oviposition is mainly nocturnal. In the plantation, the eggs are almost invariably laid on or near freshly injured bark and covered with a layer of protective material. Food, temperature and moisture had a marked influence on the amount and rate of oviposition. In the laboratory, eggs were laid at all temperatures from 4·6 to 32°C. [40·28–89·6°F.], and the average number per female was more than 300 at temperatures of 20–28°C. [68–82·4°F.] when fresh bark of hoop pine was provided as food. Except in winter, plantation temperatures normally fall within the latter limits. Egg-laying was considerably reduced on a diet

of hoop-pine foliage, and the length of life was reduced at temperatures above 15°C. [59°F.] ; without food the adults did not live long and oviposition was negligible. In the plantation, moist or wet weather always stimulated oviposition. The duration of the egg stage was 7–10 days under normal conditions, but it was as short as five days at relative humidities of 90–100 per cent. and temperatures of 25–27°C. [77–80·6°F.] and exceeded 40 days at 10°C. [50°F.]. Usually all eggs kept at 12·2–32·2°C. [53·96–86·36°F.] hatched. The threshold of development was estimated as 4°C. [39·2°F.]. Hatching was at a maximum in a saturated atmosphere and decreased with the humidity to zero at 17 per cent., but mortality was not great at humidities above 50 per cent. Monthly mean relative humidities in the plantation were never below 50 per cent. during these investigations, and as plantation temperatures are normally favourable, hatching can take place throughout the year. In the laboratory, establishment of newly emerged larvae in the phloem occurred at all temperatures from 10·2 to 34·8°C. [50·36–94·64°F.], but larvae without food survived longest in saturated atmospheres, and humid conditions in the plantation are therefore most favourable in enabling young larvae to search for and penetrate bark wounds. Temperature had a marked influence on the length of the larval stage, which was shortest between 24 and 25°C. [75·2–77°F.], when it averaged 54·5 days for individuals that passed through six instars. The number of instars may be five or six, and the variation cannot be assigned to food or sex. Pupation takes place in a depression in the surface of the wood. The pupal stage averaged 13·4 days. Development was most rapid at relative humidities of 74–95 per cent., and the minimum pupal period (nine days) occurred at 30·2°C. [86·36°F.]. The total development period and the complete life-cycle were shortest (about 69 and 92 days, respectively) at 25°C., but field observations showed that a generation may be completed in three months during the summer under natural conditions and in 5–7 months in winter, indicating that there may be 2–3 generations in the year.

The adults remained in the pupal chambers for about 12 days. They were ready to mate as soon as they emerged from them, but the average rate of oviposition was not attained until about 7½ weeks later ; a mean period of 36 days elapsed between the cessation of oviposition and death. Both sexes paired several times. At all experimental temperatures below 30°C. [86°F.] the weevils outlived a test covering 132 days, but they soon died at higher temperatures. The threshold of adult activity was shown to be about 0°C. [32°F.]. Adult flight was observed only once, but evidence indicated that it must be common in the plantation ; adults were present in the plantation throughout the year.

Pruning cuts are attractive to the weevil, which deposits its eggs on the stubs. The young larvae enter the cambium and penetrate to the bole of the tree, where they continue to feed on the inner bark ; tunnelling encircles the base of the stub where the bark is relatively thick, and, if the larvae are numerous, may spread along and round the bole. The tree may die, but more usually the slow occlusion of the injury results in an unevenly shaped bole. Attacks are accompanied by the ejection of frass from the pruned stubs and a dark gum-like seepage down the trunk. Larvae that enter the pith of stubs fail to develop, but some feeding takes place, and rain water collects in the cavities and promotes wood rot.

Treatment of the cut surfaces with creosote or coal tar inhibited gum exudation and prevented oviposition by *Aesiotes*, but preparations containing copper salts stimulated undesirable exudation of gum. Adhesive bands placed above and below pruned stubs did not prevent oviposition. Since moist weather favours activity and development of the weevil, pruning and thinning should be carried out when dry weather is normally to be expected, in winter and early spring. Pruning at this time is not accompanied by attacks of economic importance. Minor damage is associated with jagged wounds and slight

lifting of the injured bark, mainly on the lower surface of the stubs, but the accumulation of gum exudation usually forms a barrier that prevents infestation of the bark by the larvae. Pruning should therefore be done with a sharp saw in order to leave clean and even cut surfaces and avoid injuring the main stem. Thinnings serve as breeding grounds for *Aesiotes*, and thinning can be combined with pruning so that the discarded stems attract the adults and thereby afford protection to the pruned trees.

Natural enemies include a fungus of the genus *Isaria*, that attacks all stages, and mites, which attack all stages except the eggs, but neither of these is of much importance. A Clerid, *Stigmatium ventrale*, Macleay, sometimes destroys many of the eggs, and larvae of an Elaterid, *Alaus prosectus*, Cand., prey on both larvae and pupae in thinnings, but prefer Longicorn larvae when these are present. The larvae of an Anthomyiid, *Helina calyptrata*, Mall., are of appreciable value, though they attack only the earlier larval stages.

Five other Coleoptera are associated with pruned hoop-pine trees, but they should not become injurious if standard silvicultural practices are carried out. The Scolytid, *Hylurdrectonus piniarius*, Schedl, is numerous in the plantations and is attracted to any freshly-cut surface on living trees. The adults excavate egg tunnels into the bark from the extra-cambial tissue of the wound, and the young larvae mine mainly in the cortex, although their development can be completed in the phloem. The attack lasts for only one generation, which is completed in 4–6 weeks, but accelerates the breakdown of tissue about the stubs, increasing the amount of lifting of the bark from the wood and thereby assisting the entry of *Aesiotes* larvae. The other four insects attack pruned trees later than *Aesiotes* and *Hylurdrectonus*. The larvae of the Cerambycid, *Syllitus araucariae*, McKeown, and an unidentified Buprestid usually occur in trees that have been infested by the Scolytid, and are of little importance, as they do not injure living tissues. The larvae of the Lamiid, *Temnosternus imbilensis*, McKeown, and of an unidentified weevil also normally feed only on dying tissue but may penetrate into living tissue. They occur mainly at the lower side of the stub and usually cause the bark to die back to the sapwood of the bole, so that occlusion must cover a much larger area. Rain water often collects in the pockets made below the stubs and induces a stain in the wood, which may be followed by decay of the surrounding bark and damage as serious as that caused by *Aesiotes* larvae.

Many insects are associated with hoop-pine thinnings. Large numbers of larvae of the Trypetid, *Rioxa araucariae*, Tryon, and an undetermined Stratiomyiid congregate under the lifting bark and set up a wet rot that makes conditions unsuitable for *Aesiotes* larvae. A Cerambycid, *Diotimana* (*Diotima*) *undulata*, Pasc., and a weevil, *Ilacuris laticollis*, Pasc., which are usually very numerous and can attack thinnings anywhere along the bole, also affect the development of *Aesiotes* adversely. The other insects do not normally attack the thinnings until after *Aesiotes*.

LIEBERMAN (F. V.). **New Insecticides for Control of Alfalfa-seed Insects.**—*Farm & Home Sci.* **6** no. 3 pp. 3–4, 1 fig. [Logan,] Utah, 1945.

Experiments were begun in western Utah in 1944 on the effectiveness of dusts containing sabadilla [*cf. R.A.E.*, A **34** 144] and DDT against Capsids of the genus *Lygus* attacking lucerne grown for seed. A locality was chosen in which cross-pollination is assured by a large population of wild bees, particularly *Nomia melanderi*, Ckll. The trials were on small plots, but the dusts were applied by tractor and all operations closely approximated normal farm practice. The flower buds in the untreated parts of the field were so severely damaged by *Lygus* that most of the plants failed to bloom and only 23 lb.

cleaned seed per acre was produced on a typical plot. Plots treated once with 10 per cent. DDT at 27·5 lb. dust per acre yielded an average of 385 lb. per acre, and for several weeks, nymphs were killed as they hatched and adults as soon as they entered from the surrounding area. Dusts containing 10 and 20 per cent. sabadilla applied at 25–32·5 lb. per acre were effective at the time of treatment but lost their toxicity in about one day. Second applications made seven days after the first, when nymphs were as abundant as before, gave the same result. However, the double treatment enabled the plants to flower and set seed, and the plots receiving the 10 and 20 per cent. dusts yielded 134 and 185 lb. seed per acre, respectively. Plots treated twice at an interval of seven days with a pyrethrum dust at 14–16 lb. per acre as a standard of comparison yielded only 89 lb. per acre. Large populations of Aphids and thrips present on all plots at the time of dusting were practically eliminated by the DDT and slightly reduced by the other treatments. DDT also reduced the numbers of predacious insects. No bees were observed to be killed by DDT, but large-scale experiments must be made to determine whether it is possible to dust lucerne seed crops before flowering without endangering both wild bees and honey-bees ; dosages, timing of treatment and toxicity to live-stock must also be studied before recommendations can be made.

SORENSON (C. J.) & CARLSON (J. W.). **New Insecticides give Promise for Control of *Lygus* Bugs in Alfalfa grown for Seed.**—*Farm & Home Sci.* **6** no. 3 pp. 5, 11, 1 fig. [Logan,] Utah, 1945.

Dusts containing 3 or 10 per cent. DDT or 10 per cent. sabadilla were compared with a mixture of sulphur and pyrethrum dust (Pyrocide) for the control of *Lygus* on lucerne grown for seed in northern Utah in 1944 [*cf.* preceding abstract]. Hand dusters of the rotary type were used, and the plots were covered with cloth cages during application to reduce drift. Each dust was used at 30 and 50 lb. per acre, but there was no practical difference in the results obtained with the two rates, both of which are heavy. Applications of the pyrethrum and sabadilla dusts were made once and twice weekly from 18th July until 9th September, and the same programme was followed for DDT until 8th August. The lucerne in neighbouring fields was cut on 6th August, and large numbers of adults of *Lygus* then invaded the experimental plots, but the treatments applied on 8th August reduced the population to approximately its previous low level. The DDT kept it low with no further application until 22nd August, when it was again rising to dangerous numbers and one more treatment was given.

Lygus populations were estimated by sweeping immediately before the application of the dusts and 24 hours afterwards, and the reactions of the bugs were studied 10, 30, 60 and 180 minutes after treatment on individuals kept in cages on the treated plots. *Lygus* was controlled most effectively and the average yields of seed were highest where 10 per cent. DDT was used, and the next best results were given by 3 per cent. DDT, followed by sabadilla. A high population of *Lygus* was consistently correlated with low yield of seed. Application of the dusts twice weekly gave slightly better results than once weekly. The effectiveness of the sulphur-pyrethrum dust was low under all conditions. No important differences were noted in the effects of the various insecticides on the bugs in cages, but sabadilla appeared to be more rapid in action than the others. Nymphs appeared to be somewhat more resistant than adults to all the insecticides. After the beginning of treatment, practically no nymphs were taken on plots receiving DDT. Thrips were extremely abundant on untreated lucerne, particularly during the flowering period, and scarce on plots treated with DDT.

KNUTSON (H.). **Minnesota Phalaenidae (Noctuidae). The seasonal History and economic Importance of the more common and destructive Species.**—*Tech. Bull. Minn. agric. Exp. Sta.* no. 165, 128 pp., 22 graphs, 39 refs. St. Paul, Minn., 1944.

Introductory sections of this bulletin include brief accounts of the economic importance of Noctuids in Minnesota, characteristic features of their life-history and ecology, the topography, climate and vegetative regions of the State, and the way in which information on individual species was obtained by collections from light-traps and by hand, rearing records and the examination of museum specimens. In the main part, the results of this work are given for 107 species, with particular reference to their seasonal history and the economic importance of some of them, and a further 165 species, which are less common, are recorded in a table that shows for each the periods during which adults were collected, the total number taken, the number taken in light-traps, the month or months of maximum abundance, and the probable number of generations a year. The flights of 54 of the more common species, as determined by light-trap records in several years, are represented on graphs.

The numbers of annual generations are estimated for 232 species, of which 175 have one generation and 57 have more. All the multiple-generation species normally have two generations a year in Minnesota ; the extent to which the number of generations produced by such species varies in different parts of their range and is affected by temperature is discussed, and it is shown that seasonal histories can be better calculated on the basis of adult flights than they can in the case of species that have only one generation a year. The effects of meteorological factors on flights and investigations indicating the reliability of light-trap studies for most of the species are also briefly described.

VORHIES (C. T.) & WEHRLE (L. P.). **Preliminary Tests of DDT Applications to Crop Plants and Livestock with Navy's Fog Generator.**—*Mimeogr. Rep. Ariz. agric. Exp. Sta.* no. 75, 13 pp. [Tucson, Ariz.] 1945.

The authors describe experiments carried out in Arizona in 1945 to determine whether a fog-generating apparatus used by the United States Navy to produce a " smoke screen " could apply insecticides (chiefly DDT in oil) against flies on livestock [*R.A.E.*, B **34** 141] and for the rapid treatment of plants over a large area.

In preliminary tests, enough fog to cover a block of grape-vines 220 yards long and 200 yards wide was produced in seven minutes when the apparatus was driven along the west and south sides of the block and the wind was in the south-west, but the fog tended to lift as it rolled across and coverage was good for only about half of the distance from each treated side. When a ten-acre block of *Citrus* was treated by the same method, the fog hung better among the trees, but did not reach the north-east corner ; the ten acres were again covered in about seven minutes with 49 lb. oil carrying 33 oz. DDT, and some control of thrips was secured in the area nearest the fog generator. In further tests over bare ground and pasture land, there was difficulty in keeping the fog near the ground in some cases, owing to wind or convection currents of the air.

In a more detailed experiment, a 5 per cent. solution of DDT in a 9 : 1 mixture of kerosene and oil with a viscosity of 60 was applied to a ten-acre block of vines. The generator travelled along the west side, across the south end and then north for 22 rows (about half the length of the block), after which it went through every fifth row from there to the north end. The wind was in the south-west and there was a moderate breeze. *Erythroneura variabilis*, Beamer, and *Dikraneura cockerelli*, Gill., were present in approximately equal numbers and showed no difference in susceptibility to the treatment. Before it,

the numbers of leafhoppers per vine were 18 in the centre of the block, 61 at the east end, 13 at the west end and 38 on young vines near the south end, giving an average of 32. The morning after treatment, there were two leafhoppers on six vines in the first row downwind from the machine, 22 on five vines three rows downwind, except at the end adjacent to the machine where there was one on two vines, and 29 on one vine 22 rows downwind, with a probable loss of 25 due to windy conditions and the activity of the insects ; the last figures indicate that no substantial control was obtained at that distance from the machine. In the young vines, there were seven leafhoppers on four vines selected at random from the first six rows. One day later, there were four leafhoppers on six vines within the block, six on five vines at the east end, except on one vine 22 rows downwind from the machine that had 12, two on five vines at the west end and six on three of the young vines. Thus, except on the vine at the greatest distance from the machine, there were less than two leafhoppers per vine on the first day after treatment and one per vine on the second. Treatment of a ten-acre block of *Citrus* with the same fog applied by a generator moving along every row gave complete kill of *Scirtothrips citri*, Moult., but had no noticeable effect on *Anaphothrips obscurus*, Müller, the young stages of which were abundant on the trees.

From these results it is concluded that the method shows promise, but that further investigations are required on the particle size and wind velocity required for efficient application. The cost was rather less than half that of spraying.

BROOKS (A. R.). **New Canadian Diptera (Tachinidae).**—*Canad. Ent.* **77** no. 5 pp. 78–96. Guelph, Ont., 1945.

The 25 new Tachinids described belong to 19 genera, two of which are also new. There are no host records for the majority, but it is stated that many of them were reared from injurious insects in the course of work by the Forest Insect Survey. The North American species of *Lypha* other than *L. maculipennis*, Aldr., have been referred to *L. dubia*, Fall., but this European Tachinid was not found in a study of Canadian material [*cf.* also *R.A.E.*, A **23** 170]. A key is given to the Canadian species, which comprise *L. maculipennis*, *L.* (*Didyma*) *setifacies*, West, and four new ones. *L. setifacies* is an important parasite of *Harmologa* (*Archips*) *fumiferana*, Clem., in Ontario and Quebec ; the females larviposit on the foliage of spruce and fir [*Abies*] early in June, the larvae leave their hosts to pupate after about a month, and the adults emerge in the following May. The Canadian National Collection also includes specimens of this Tachinid from Manitoba, New Brunswick and New York, and some reared from *Tortrix* (*Archips*) *rosaceana*, Harr., in Quebec.

In describing a new species of *Ceromasia*, the author states that there are three Canadian species of this genus and that their identity has been obscured by the fact that they have been recorded as *Masicera* (*Erycia*) *rutila*, Mg., which does not occur in North America [*cf.* **7** 174 ; **19** 725].

ALFARO (A.). **La invasión del escarabajo de la patata al iniciarse la campaña de 1943.** [The Invasion of the Potato Beetle at the Beginning of the Campaign of 1943.]—*Bol. Pat. veg. Ent. agríc.* **12** pp. 1–8, 1 map, 1 ref. Madrid, 1943.

The author refers to the distribution of the potato beetle [*Leptinotarsa decemlineata*, Say] in Spain in 1941 [*cf.* *R.A.E.*, A **33** 165] and states that it continued to spread there in 1942, when it occurred in 26 provinces. Its distribution by the end of that year is shown on a map and discussed in some detail. Its subsequent more extended distribution has been noticed from a later work [**34** 100].

ALFARO (A.). **Un ciclo de desarrollo en el escarabajo de la patata.** [A Cycle of Development in the Potato Beetle.]—*Bol. Pat. veg. Ent. agric.* **12** pp. 9–30, 11 figs., 1 ref. Madrid, 1943.

Studies on the bionomics of *Leptinotarsa decemlineata*, Say, were carried out in the laboratory in Spain in 1941–43. Rearing was begun with overwintered adults taken in the field in early May 1941, some of which might already have oviposited in the preceding year, and 20 females were isolated in jars, 15 together with males and five after having been confined with males for almost a day, during which pairing took place. Fresh potato leaves were provided daily, and the eggs laid were counted, the results being shown in detail in tables. The total number of eggs laid by individual females ranged from 23 to 2,561 and 11 females continued to oviposit until September. There was little difference between the numbers laid by females in the two groups. It is calculated that the total number of eggs laid diminished by about 25 per cent. each month during the four months of the experiment. Only 3 of 12 first-generation females that emerged in the laboratory in July 1942 oviposited, the numbers of eggs obtained being 195, 372 and 577, and there was a general tendency to enter the soil. This was still greater in females of the second generation, none of which laid any eggs in the laboratory in 1942 or 1943, though some were gravid.

The results of the further rearing experiments, in which potato leaves were provided for the larvae and soil for the pupae, are shown in detail in tables and discussed. The duration of development was dependent on temperature, and the averages for the egg, larval, prepupal and pupal stages were 6·5, 16·5, 4 and 7 days, respectively. There are two generations a year in Spain, and some adults of both of them overwinter. Some second-generation females oviposit before overwintering, but the third generation does not complete its development owing to lack of food and the onset of winter cold.

ALFARO (A.). **El escarabajo de la patata y la alimentación.** [The Potato Beetle and its Feeding.]—*Bol. Pat. veg. Ent. agric.* **12** pp. 31–44, 2 figs., 6 refs. Madrid, 1943.

As it had been shown that *Leptinotarsa decemlineata*, Say, can complete its development on tomato [*R.A.E.*, A **33** 166], experiments were carried out in Spain in 1942 in which young larvae or adults were placed on various other Solanaceous plants in the laboratory. The results, some of which are given in tables, showed that development was completed normally and adults fed on egg-plant [*Solanum melongena*], bittersweet (*S. dulcamara*), belladonna (*Atropa belladonna*) and *Hyoscyamus niger*, that some adults but no larvae fed on *Solanum nigrum* and *Datura stramonium* and that neither accepted tobacco, *Capsicum* or *Physalis alkekengi*. The newly hatched larvae frequently feed on eggs of their own species that happen to be near them, and in experiments, development was completed normally on a diet of eggs alone. The adults also sometimes feed on the eggs, and both larvae and adults sometimes attack larvae.

ALFARO (A.). **El escarabajo de la patata y el clima.** [The Potato Beetle and Climate.]—*Bol. Pat. veg. Ent. agric.* **12** pp. 45–76, 19 figs., 1 fldg. map, 16 refs. Madrid, 1943.

From consideration of the distribution of *Leptinotarsa decemlineata*, Say, on potato in the United States and Canada, the author shows that it occurs there in a region that lies between the annual isotherms of 5 and 20°C. [41 and 68°F.]. It is probable that it will also prove able to survive in the corresponding area of Europe, which includes all the European countries at present known to be infested. Spain lies within annual isotherms of 14 and 19°C. [57·2

and 66·2°F.] and some of its more southerly provinces are close to the upper limit. Minimum temperatures over the whole peninsula are well above those experienced in North America, and it is not thought that temperature will afford much control of the beetle in Spain. Soil humidity affects the depth to which the larvae enter the soil for pupation, and they are unable to enter very dry soil, but in some districts in Spain that are naturally very dry, a sufficient degree of soil moisture is provided by irrigation. The effect of temperature on the duration of the various stages is briefly discussed, and a hyperbola illustrating its effect on complete development is constructed from experimental data according to the method of Bodenheimer [*R.A.E.*, A **13** 389; **23** 296], the threshold of development being 11·5°C. [52·7°F.] and the thermal constant 335·4 [603·72] day-degrees. Temperature also affects the migration of the adults, since flight is stimulated by temperatures of 25°C. [77°F.] and above. The climatic conditions of the various regions of Spain are discussed at some length and illustrated on graphs, and local variations that are favourable or unfavourable to the development of the beetle are pointed out. It is concluded that conditions are generally suitable over the whole of the country and very favourable in the more northerly provinces.

DEL CAÑIZO (J.). **Parásitos de la langosta en España. I. Dípteros Bombílidos.** [Parasites of the Locust in Spain. I. Bombyliids.]—*Bol. Pat. veg. Ent. agríc.* **12** pp. 77–99, 3 pls., 12 figs., 21 refs. Madrid, 1943.

The author gives a key, based on the literature, to the genera of Bombyliids that have been recorded as parasitic in the egg-pods of *Dociostaurus maroccanus*, Thnb., in Spain. The six species that he has himself observed there since 1925 are *Cytherea* (*Glossista*) *infuscata*, Mg., which is the commonest [*cf. R.A.E.*, A **19** 277] and was reared from 50 per cent. of the pods collected in Badajoz and Jaén, *C. obscura*, F., *Systoechus sulphureus*, Mikan, *S. gradatus*, Wied., *Anastoechus nitidulus*, F., and *Thyridanthrax fenestratus*, Fall. He describes the adults of these, gives notes, largely from the literature, on their bionomics and distribution in Spain and elsewhere, and concludes that though they may sometimes destroy many of the pods deposited by locusts in phase *gregaria*, which are concentrated within fairly limited areas, they are ineffective against those of phase *solitaria*. There is little prospect of increasing their effectiveness by artificial means.

MORALES AGACINO (E.). **Estado actual del problema de la langosta del desierto (*Schistocerca gregaria* Forsk.) en el Sáhara occidental. (Nota informativa.)** [The present State of the Problem of the Desert Locust (*S. gregaria*) in the western Sahara. (Preliminary Note.)]—*Bol. Pat. veg. Ent. agríc.* **12** pp. 100–106, 3 figs., 2 fldg. maps. Madrid, 1943.

The author carried out three surveys for the presence of *Schistocerca gregaria*, Forsk., in Rio de Oro and neighbouring territory in 1941–43. He shows his itineraries on a map and states that two areas were found to be infested. These were the valley of the Seguiat el Hamra, towards the north [*cf. R.A.E.*, A **31** 261], and a region of varying width extending to the north-east for about 200 miles from Adrar Suttuf and Zug, in the extreme south. Eggs, nymphs in various instars and adult locusts were observed in both, and in some cases the adults occurred in small bands. Further investigation is desirable to ascertain whether these areas represent permanent breeding grounds. Reference is made to the various official bodies set up in other countries for the promotion of research on locusts and to the subjects dealt with at a recent Anti-locust Conference at Algiers.

Moreno Márquez (V.). **Observaciones sobre la oviposición de** *Dociostaurus maroccanus* **(Thunb.).** [Observations on Oviposition in *D. maroccanus*.]—*Bol. Pat. veg. Ent. agríc.* **12** pp. 107–122, 8 figs., 7 refs. Madrid, 1943.

The processes of pairing and oviposition in *Dociostaurus maroccanus*, Thnb., are described and an account is given of experiments in Spain in which batches of adults of both sexes were confined in cages over six types of soil in trays; most egg-pods were deposited in soil that was compact and stony. In further experiments, six females were kept singly, each with a male, over suitable soil, and the numbers of egg-pods produced were recorded. They ranged from 3 to 10, with an average of 6, and the number of eggs per pod in 25 pods averaged 30. It has been thought that males of *D. maroccanus* die before the females, but in four of the six cages, the female died before the male. If the males commonly outlive the females, it would explain records of the great predominance of males in nature, since in investigations by the author on the sex ratio among the nymphs, males constituted only 54·7 per cent. of the total.

Bellod (M.). **Una plaga del almendro,** *Diloba caeruleocephala* **L.** [*D. coeruleocephala*, a Pest of Almond.]—*Bol. Pat. veg. Ent. agríc.* **12** pp. 123–136, 1 pl., 13 figs., 10 refs. Madrid, 1943.

Descriptions are given of all stages of *Diloba coeruleocephala*, L., which is injurious to almond in the Provinces of Alicante and Valencia, Spain, and its distribution is reviewed from the literature. Observations in 1942–43 on the bionomics of this Noctuid showed that it has one generation a year and overwinters in the egg stage. The eggs were laid in November in masses of up to 27 on the woody twigs and rarely on the trunks or main branches. The larvae began to hatch early in February, when the leaves appeared, became most numerous at the end of that month, and were observed on the trees until May. They fed on the leaves, leaving only the mid-veins, and also on the young fruits, causing considerable loss of crop, and left the trees for pupation. The pupae are usually difficult to find, but large numbers were discovered in the heaps of stones that are common in infested orchards. The adults emerged in the laboratory and the field in November, mostly during the first half of the month, and paired immediately. Oviposition occurred 2–9 days later. Females laid up to 71 eggs in the laboratory, but were shown by dissection to contain up to 113.

In experiments on control, the spray of 10 lb. lead arsenate in 100 gals. water sometimes applied in other districts in spring against *Aglaope infausta*, L. [*cf. R.A.E.*, A **22** 609] proved effective against the larvae, but since they are much more susceptible to arsenicals than those of *A. infausta*, it is thought that one of half this strength will prove satisfactory, especially if molasses is added to improve the suspension [*cf. loc. cit.*]. The weaker spray would also reduce the risk of scorching the fruits.

Benlloch (M.). **Nueva plaga de las coles.** [A new Pest of Cabbages.]—*Bol. Pat. veg. Ent. agríc.* **12** pp. 137–142, 1 pl., 7 figs. Madrid, 1943.

The author records the finding for the first time in Spain of cabbage plants showing injury typical of *Hylemyia brassicae*, Bch.; larvae found in them were provisionally identified as this species, but adults were not reared from them. Similar larvae were later observed in severely attacked cabbage plants from a locality in Asturias, and it was stated that infestation there was serious. In view of the potential importance of this Anthomyiid, the adult and larva are briefly described and an account is given from the literature of its bionomics and control.

Ruiz Castro (A.). **Dos Tiflocíbidos nuevos en España que atacan a la vid y al pimiento.** [Two Typhlocibids new to Spain that attack Grape Vine and *Capsicum*.]—*Bol. Pat. veg. Ent. agric.* **12** pp. 143–189, 3 pls., 48 figs., 2 maps, 22 refs. Madrid, 1943.

The systematic position and characters of the genus *Empoasca* are discussed, the adults of both sexes of *E. lybica*, Bergevin, and *E. decipiens*, Paoli, are described, and the distribution and food-plants of these two Jassids are reviewed from the literature. *E. lybica*, of which *E. benedettoi*, Paoli [*R.A.E.*, A **21** 60] has been found to be a synonym, causes considerable injury to the leaves of grape vines in the Provinces of Almeria and Murcia, Spain [*cf.* **26** 700], and this leads to a reduction in crop. The development of the nymphs lasts 25–30 days in the field, but was completed in 17 days in the laboratory in July. The adults usually appear in the vineyards in the second half of June, though they have been observed in Murcia as early as May, and injury becomes apparent in mid-July. There are 4–5 generations during the summer and early autumn in Almeria, and large populations develop in August and early September. Infestation decreases at the end of October, and has practically ceased by mid-November. The adults shelter during the winter on wild plants near the vineyards, principally *Inula viscosa* and *Mentha rotundifolia*, and resume activity on warm days, but do not appear to feed or breed on these plants. The discoloration and crinkling caused to the leaves of the vines are described in detail; since no further injury appeared on caged plants after the Jassids on them had been destroyed, it is thought not to be due to a virus.

Experiments on control are described; in addition to the treatments already noticed [**26** 700], a spray of Bordeaux mixture and nicotine was effective against the nymphs, but in view of the results obtained by DeLong with Bordeaux mixture against *E. fabae*, Harr., on beans in the United States [**29** 439–441], which are reviewed in detail, a spray of Bordeaux mixture alone, applied at the end of June or as soon as the nymphs are observed on the leaves, and again 8–10 days later, is recommended. If the population is still great in August, owing to immigration from untreated vineyards, a contact insecticide, such as a dust of pyrethrum and sulphur (1 : 4), should be applied.

E. decipiens was observed for the first time in Spain in 1935, causing discoloration and shedding of the leaves of *Capsicum* in Almeria. It has four generations a year, and as a result of the injury to the leaves, the fruits do not develop and the plants sometimes die. Nicotine dusts and a spray of nicotine in Bordeaux mixture proved effective against both nymphs and adults of this Jassid, but in view of the shortage of nicotine, the treatment with Bordeaux mixture alone is recommended against it.

Benlloch (M.). **Notas de patología olivarera en 1943.** [Notes on the Pathology of the Olive in 1943.]—*Bol. Pat. veg. Ent. agric.* **12** pp. 237–248, 2 pls., 4 figs., 4 refs. Madrid, 1943.

Some of the information in these notes concerns insect pests of olive in Spain in 1943. It was observed in the course of work on *Dacus oleae*, Gmel., in southern districts that the adults were not attracted to ripe fruits, even while they were still attached to the tree, so that though the percentage infestation reached 80–90 among unripe fruits, it was less than ten among ripe ones. It is thought that the oil in the latter prevents oviposition or kills the newly hatched larvae, and that its presence may explain why any larvae that mature, unlike those of earlier generations, leave the fruits before pupation. *Prays oleellus*, F., was of little importance, probably owing to the good crop, which led to diffusion of oviposition. One grove in Cordoba was infested by an unidentified mite of the genus *Ericphyes*, which formed galls on the leaves and caused a dark green discoloration. The infestation was favoured by high humidity and the presence on the trees of numerous young tender shoots.

PLANES (S.). **Influencia del tamaño de las gotas del aceite en la eficacia de las emulsiones insecticidas.** [The Influence of the Size of the Droplets of Oil on the Effectiveness of insecticidal Emulsions.]—*Bol. Pat. veg. Ent. agríc.* **12** pp. 249–252, 2 pls. Madrid, 1943.

The author concludes from a comparison of the effectiveness of seven proprietary oil emulsions against *Chrysomphalus dictyospermi*, Morg., on *Citrus* in Spain with the size and density of the droplets of oil deposited by them on a sprayed surface that droplet size alone cannot serve as a criterion of efficiency. The size of the droplets increased and mortality decreased with greater viscosity, but viscosity was not the only factor involved in droplet size. The latter depended chiefly on the emulsifier employed, and for a given emulsifier it decreased as the amount of emulsifier increased.

RUIZ CASTRO (A.). **Nota sobre el análisis químico del fosfato amónico utilizado como daquicida.** [A Note on the chemical Analysis of the Ammonium Phosphate used against *Dacus*.]—*Bol. Pat. veg. Ent. agríc.* **12** pp. 277–284, 11 refs. Madrid, 1943.

Ammonium phosphate is the most effective of the attractants tested in Spain for use in traps against *Dacus oleae*, Gmel., on olive [*R.A.E.*, A **29** 462], but commercial ammonium phosphates contain many impurities, including ammonium sulphate, which itself possesses some attractiveness, and various other phosphates, which have none, so that their comparative effectiveness is difficult to assess. The author has therefore developed and here describes methods of determining the total content of the ammonium radical and the content of ammonium sulphate present in any given sample, so that the content of ammonium phosphate can be obtained by subtraction.

MENDIZÁBAL (M.). **Datos sobre la plaga de langosta en la Provincia de Almería.** [Data on the Locust Outbreak in the Province of Almeria.]—*Bol. Pat. veg. Ent. agríc.* **12** pp. 285–293, 2 figs., 2 graphs, 6 refs. Madrid, 1943.

After having been of little economic importance in Almeria for some time, locusts have again become locally injurious there. Surveys in 1942 and 1943 showed the presence in the south-western coastal region of two infested areas in which the predominant form was *Dociostaurus maroccanus*, Thnb., which is the most important species. The coloration of both nymphs and adults indicated that they were not in phase *solitaria*, and a study of their biometrical ratios, which are compared in a table with those of this species from elsewhere, showed a tendency towards phase *gregaria*. Hatching began on 23rd February in one district in 1943, but the nymphs were destroyed by rain; further nymphs hatched in the second week of March, whereas hatching had not occurred until April in 1942. The monthly temperature and precipitation from July 1941 to June 1943 are shown in tables and graphs, and a list is given of the plants of the district.

Other small foci were observed in which *D. maroccanus* was outnumbered by Acridids of less importance, including *Oedaleus decorus*, Germ., and *Ramburiella hispanica*, Ramb., and which also included *Calliptamus italicus*, L., and its var. *marginellus*, Serv., and there was one small area of intense infestation from which *D. maroccanus* was absent but in which great damage was being done by the Tettigoniids, *Steropleurus perezi*, Bol., and *Decticus albifrons*, F.

Sodium-arsenite baits applied in spring gave good control in all cases and were particularly effective against the Tettigoniids.

AGENJO (R.). **Determinación específica del Lepidóptero denominado "barrenador del arroz".** [The Specific Determination of the Moth known as the Rice Borer.]—*Bol. Pat. veg. Ent. agríc.* **12** pp. 294–298, 1 pl., 2 figs., 6 refs. Madrid, 1943.

Examples of the moth borer that infests rice in Spain [*R.A.E.*, A **29** 458] have been identified as *Chilo simplex*, Btlr., by Meyrick and as *C. oryzae*, Fletcher, by Rebel. Japanese workers consider that the latter is identical with the former [**21** 102], but synonymy of the species cannot be determined without comparison of the genitalia, and the author states that this comparison has never been made. He considers, however, that the Spanish species is *C. simplex*, as the genitalia of both sexes correspond to those of specimens identified as *C. simplex* in the United States.

GÓMEZ CLEMENTE (F.). **Cochinillas que atacan a los agrios en la región de Levante.** [Coccids that attack *Citrus* in the eastern Coastal Region of Spain.]—*Bol. Pat. veg. Ent. agríc.* **12** pp. 299–328, 11 pls., 2 figs., 1 fldg map, 23 refs. Madrid, 1943.

The author gives a list of the 12 Coccids that attack *Citrus* in the eastern coastal region of Spain, with their synonyms and Spanish vernacular names and notes on their origin, distribution, economic importance, morphology and bionomics, a table showing which occur in each of the eight zones into which the region is divided and the varieties of *Citrus* cultivated in these zones, and a map showing the distribution in the region of nine of them. All are introduced, and the most injurious are *Chrysomphalus dictyospermi*, Morg., *Lepidosaphes* (*Mytilococcus*) *beckii*, Newm., and *L.* (*M.*) *gloveri*, Pack., which are widely distributed, and *Pseudococcus citri*, Risso, and *Parlatoria pergandei*, Comst., which are important locally.

DOMÍNGUEZ GARCÍA-TEJERO (F.). **Las plagas de los frutales en España y su distribución geográfica.** [The Pests of Fruit Trees in Spain and their geographical Distribution.]—*Bol. Pat. veg. Ent. agríc.* **12** pp. 329–352, 7 pls., 3 figs., 5 maps, 37 refs. Madrid, 1943.

The author gives a list based on reliable records and his own observations of the Lepidoptera that attack fruit trees in Spain, with information as to their local distribution and the trees they attack, and shows the distribution of some of them on maps. He intends to deal similarly with the insects of other Orders in subsequent papers.

GÓMEZ-MENOR (J.). **Afidos que viven sobre frutales.** [Aphids that live on Fruit Trees.]—*Bol. Pat. veg. Ent. agríc.* **12** pp. 353–410, 137 figs., 26 refs. Madrid, 1943.

This paper deals mainly with the Aphids that attack fruit trees in Spain, but, on account of their potential importance, it includes some that do so elsewhere though they are unknown or occur only on other plants in Spain. Following general descriptions of the three types of females produced by Aphids (alates and apterous viviparae and oviparae) and a note on the preparation of specimens, the author gives a key to the genera and short descriptions of the genera and species. Keys to the latter where necessary and notes on food-plants, distribution and in some cases synonymy are included.

MENDIZÁBAL (M.). **Cerambícidos de interés agrícola.** [Cerambycids of agricultural Interest.].—*Bol. Pat. veg. Ent. agric.* **11** pp. 387–410, **12** pp. 436–476, 42 figs., 31 refs. Madrid, 1943.

The author gives notes on the bionomics, the appearance of the adults and the distribution of a large number of Longicorns that attack plants of economic importance (excluding forest trees) in Spain and neighbouring countries, and enumerates the plants attacked by each. There is an index to the species and a list of plants showing the species that attack them.

LIEU (K. O. V.). **The Study of Wood Borers in China. I. Biology and Control of the Citrus-root-Cerambycids,** *Melanauster chinensis,* **Forster (Coleoptera).** —*Florida Ent.* **27** no. 4 pp. 62–101, 4 figs.. 10 refs. Gainesville, Fla., 1945.

Details are given of investigations on the bionomics and control of *Melanauster chinensis,* Forst., attacking *Citrus* in Szechuen, and all stages of this Lamiid are described. It was found that it has one generation annually; the adults, which live for about a month, are present from late May to early August and feed on the leaves and petioles, and on the bark of twigs and branches and of the trunks of very young trees. Mating occurs soon after emergence, and the preoviposition period may last 1–2 weeks. The eggs are deposited in slits cut in the bark of the tree near the ground and hatch in 1–3 weeks. The larvae feed under the bark for about two months, after which they bore into the woody tissues of the lowest portions of the trunks, the roots and the rootlets. A single larva can cause the death of a tree 5–6 years old or less. The larval stage is completed in about ten months, and the period between pupation and the emergence of the adult from the tree is about six weeks. No parasites were observed, but the eggs were attacked by ants.

Control experiments showed that eggs and young larvae under the bark can be destroyed by hand if the trunks of the trees to a height of one foot from the ground are examined for egg slits and exuding frass at intervals of 10–14 days from early July to early October. The egg slits should be pressed with the thumb to crush the eggs, and the bark under frass should be pared off so that the gallery can be uncovered and the larva killed. An older larva that had tunnelled in the wood was not affected by pyrethrum powder injected into the gallery, and it was found that the gallery had been made downwards and then upwards and was blocked where it turned by a hard, air-tight plug of wood dust. Adults refused to eat *Citrus* branches that had been whitewashed with quick-lime paste, and died in 2–6 days when they were held for five minutes in contact with branches washed with pastes of quick-lime and water, alone or with the addition of sublimed sulphur, arsenic (arsenious oxide) or calcium arsenate, so that they took some into their mouths. The mixtures acted rather more quickly than the lime alone. The beetles did not oviposit on trees treated with any of the pastes to heights of 8–20 inches, except in one test with the paste of lime alone, in which a heavy rain had washed it away at some places. The paste containing calcium arsenate was not extensively tested, but as there was some evidence that the one containing arsenic might injure the trees, one containing 20 lb. lime and 1 lb. sublimed sulphur in 8 gals. water is recommended. It should be applied to a height of one foot after a little of the soil round the base of the tree has been removed and the lower part of the trunk has been cleaned and freed from eggs or larvae, and the soil should then be replaced. The coating will remain for about two months, but the trees should be inspected once a month.

KANGAS (E.). **Eine neue *Megastigmus*-Art (Hym., Chalcididae) als Samenschädling an *Abies sibirica*.** [A new Species of *Megastigmus* injurious to the Seeds of *A. sibirica*.]—*Ann. ent. fenn.* **11** no. 3 pp. 177–184, 6 figs., 8 refs. Helsinki, 1945.

Descriptions are given of the adults of both sexes of the Torymid, *Megastigmus grönblomi*, sp. n., which emerged early in 1945 from seeds of *Abies sibirica* in locally grown cones set out to dry in a town in southern Finland. The seed was intended for planting, but 52 per cent. of one sample had been completely destroyed by the larvae and only 5–6 seedlings were obtained from 6½ lb seed. A key to the Finnish species of *Megastigmus* is given, showing their various feeding habits, and earlier identifications of species of this genus from the seeds of conifers in Finland are discussed.

KANERVO (V.). **Hajahavaintoja eräiden hyönteislajien taudeista. 1–2.** [Sporadic Observations concerning Diseases in certain Species of Insects. 1–2.]—*Ann. ent. fenn.* **11** no. 4 pp. 218–227, 6 figs., 20 refs. Helsinki, 1946. (With a Summary in English.)

Charaeas graminis, L., was abundant and widespread on grassland in Finland in 1934, and many of the larvae in one area were infested by *Empusa aulicae*. No larvae had been killed by this fungus prior to the end of May, but of 153 collected in a meadow on 30th May, about 25, 60 and 80 per cent. had died by 8th, 14th and 20th June, respectively, and of 150 taken on 12th June, about half were killed by the fungus within 10 days and all but one within 20 days. Further observations in meadows showed that nearly 50 per cent. of the larvae seen during the second week in June had been killed by the fungus and about 90 per cent. of those seen at the end of that month. Most of the larvae that died were in the last two instars. The fungus was favoured by wet weather in early June and the fact that the larvae had in some places consumed all the available food. The Noctuid was not injurious in the following year.

Pieris brassicae, L., was numerous on cabbage in southern Finland in 1928, 1936 and 1939, and many of the larvae in each of these years were infested in September by *Entomophthora sphaerosperma*. Of larvae taken in early and mid-September 1928 in one locality, about 18 and 60 per cent., respectively, died, and very few healthy examples were found at the end of that month. In experimental fields in 1936, the percentage mortality due to the fungus had increased from about 10 on 6th September to about 80 on 17th, and no healthy fifth-instar larvae could be found a week later, and in the same fields in 1939 it had increased from about 40 on 12th September to about 97 on 30th. The fungus was also found in some pupae, but gave little control of this stage. *P. brassicae* caused little damage in the years that followed outbreaks of the fungus. The larvae appeared in small numbers in the experimental fields in 1945, but only 0·6 per cent. were killed by the fungus in mid-September.

LARSSON (S. G.). *Cerura bifida* **Bkh. beskadiger et Blykabel.** [*C. bifida* injures a Lead Cable.]—*Ent. Medd.* **24** no. 4 pp. 287–289, 1 fig. Copenhagen, 1945.

A fault in a telephone system in Copenhagen that was first noticed in November 1944 and became serious in January 1945 was found to be due to a cocoon of *Cerura bifida*, Hb., that had been spun on a cable that was laid along an outside wall beneath a protective metal covering open at both ends. The cocoon was about 2 ins. from one of these ends and consisted partly of particles of lead spun together and held in place by an adhesive substance. The lead sheathing of the cable beneath had been bitten through, leaving a hole. The pupa in the cocoon was dead, and it was concluded from examination of its internal organs that it had died of lead poisoning. The larva had probably

fallen from some neighbouring poplar trees, and the cocoons of this Notodontid are usually spun on the bark.

Other Lepidoptera that are known to have injured the lead of telephone cables in this way are *Cossus cossus*, L., and *Dicranura vinula*, L.

MASSEE (A. M.). **Notes on some interesting Insects observed in 1944.**—*32nd Rep. E. Malling Res. Sta. 1944* pp. 77–83. East Malling, 1945.

Larvae of *Magdalis ruficornis*, L., were found on plum trees in Buckinghamshire in 1944, boring into the bark of the shoots below the buds and causing the buds to dry up and fall out. They live singly under the bark in small cavities and overwinter in them. Old wood appears to be preferred. The adults emerge in spring and feed on the lower surface of the leaves in May and June. This weevil is generally distributed throughout south-eastern England, and a related species, *M. barbicornis*, Latr., attacks pear in the Channel Islands [*R.A.E.*, A **21** 371] and has been numerous on medlar in Cambridgeshire. Old plum trees on a small holding in Kent were damaged, in some cases severely, by larvae of *Mordella fasciata*, F., which made galleries in the trunk and main branches. The adults, which are active on warm, sunny days and may be seen resting on the flowers of umbelliferous plants, emerged during the second and third weeks of May. Larvae of the sawfly, *Priophorus pallipes*, Lep., which is widely distributed in England, but does not usually attack cultivated trees, injured the leaves of young plum in Kent during August, and fully-fed individuals gave rise to adults in the laboratory in September. *Anuraphis schwartzi*, Börn. (*amygdali*, Buckt.), which is usually confined to peach and nectarine, was abundant on plum in Kent at the end of June ; the root suckers and water sprouts were severely affected, and the growth of the trees was considerably checked. Attack was also severe on *Prunus insititia*, *P. spinosa* and *P. padus*. The fruitlets of several varieties of plum were damaged by *Rhynchites aequatus*, L., in two districts of Kent ; it was commonest in mixed orchards of plum and apple, especially where the fruit of the latter had been destroyed by frost. The adult weevils puncture the young fruits, causing them to exude gum and become distorted. An egg was occasionally found at the base of the feeding pit. This weevil normally attacks and develops in fruits of hawthorn [*Crataegus*], but attacks allied fruits, usually apples, in years in which haws are scarce.

Aphthona euphorbiae, Schr., which is common locally in marshy situations in Britain and occurs on flax, beet and *Euphorbia* spp., was observed in June feeding in considerable numbers on the upper surface of apple leaves at several places in Essex, though the damage caused was negligible. This is thought to be the first record of a flea-beetle on a fruit tree. *Psylla* (*Psyllia*) *simulans*, Först., is locally common on unsprayed pear trees in Kent. The nymphs attack the flowers and flower buds, causing the petals to become brown and sticky, and the adults overwinter on the trees. *Caliroa limacina*, Retz., was reared to the adult stage in the laboratory for the first time. Second-generation larvae taken on pear leaves in September were confined in a cage containing a 2-inch layer of peat, the surface of which was moistened about once in every six weeks during winter and every week in spring. The larvae overwintered in the peat and pupated in the following spring ; the adults emerged in July.

Otiorrhynchus singularis, L., completely destroyed black-currant bushes planted in the previous winter over an area of one acre in Essex. The attack began at the end of May, when the weevils fed on the tips of the shoots, and continued at intervals until the end of October ; it normally ceases after mid-June. Some bushes were girdled as soon as new growth was produced and remained dwarfed throughout the season. A lead-arsenate spray temporarily checked the infestation, but it subsequently became as severe as before. Very dry weather until mid-August probably prevented the bushes from recovering,

Larvae of *Pristiphora pallipes*, Lep., caused considerable damage to gooseberry bushes and defoliated many of them at one place in Berkshire. Examples received in late June pupated at the end of that month, and the first adults emerged on 5th July. *P. pallipes* is often associated with the common gooseberry sawfly [*Nematus ribesii*, Scop.], but is usually less injurious; it is most frequent in the Midlands. Larvae of the first three generations make their cocoons in the curled leaves, and those of the fourth in the soil at a depth of 2–3 ins. Adults of this generation emerge in the following spring. Effective control is obtained if a spray of lead arsenate or derris is applied as soon as the first-generation larvae appear. Larvae of *Croesus septentrionalis*, L., partly defoliated cob nuts [*Corylus avellana*] in Kent in September 1943 and adults were reared from them in the following April. This sawfly has two generations a year, and the larvae of both make their cocoons in the soil. Control measures are rarely necessary, but a lead-arsenate spray is effective.

Drought during spring and early summer favoured the development of *Tetranychus telarius*, L., on hops, and serious infestation occurred in many hop gardens as early as the beginning of July. *Pediculoides* (*Pediculopsis*) *graminum*, Reut., which was observed in Devonshire, for the first time in Britain, in 1941 [**32** 355], has since been found infesting barley in Kent and in Gloucestershire.

GREENSLADE (R. M.). **Observations on the Life Cycle of the Apple Blossom Weevil** (*Anthonomus pomorum* (**L.**) **Curt.**).—*32nd Rep. E. Malling Res. Sta. 1944* pp. 83–92, 5 figs., 15 refs. East Malling, 1945.

Work on the bionomics and control of *Anthonomus pomorum*, L., is reviewed from the literature, including observations by H. M. Tydeman, who found that differences in the susceptibility of varieties of apple can probably be attributed to differences in flowering date, which in turn may be influenced by the root-stock, and an account is given of investigations in Kent in 1941–42. Apple is the main food-plant; the overwintered weevils often feed during the pre-oviposition period on the buds of pear, which develop earlier than those of apple, but eggs are rarely deposited in them. Isolated crab-apple trees in woods may be heavily infested. The observations on life-history were made chiefly in 1942 and were designed mainly to supply information on the activities of the overwintered adults; the results of counts made at intervals of two days on apple trees are discussed at some length. The weevils were first observed on 15th March and were present on the trees until 6th May; emergence from hibernation probably continued for about five weeks. Pre-oviposition feeding began about 27th March and continued until 12th April, and mating took place between 25th March and 26th April. Eggs, larvae and pupae were first observed on 12th April, 24th April and 20th May and were present for 27, 39 and 25 days, respectively, and first generation adults were first seen on 3rd June. The numbers of eggs increased sharply between 14th and 16th April and then remained fairly constant until hatching began. A spray of petroleum-oil emulsion applied on 2nd April against *Plesiocoris rugicollis*, Fall., reduced the number of weevils on the trees, presumably by killing them, since immigration continued while the deposit was still present.

Attempts in 1942 to control the adults by means of a proprietary derris dust stated to contain not less than 0·25 per cent. rotenone, which was applied on 14th, 15th or 16th April, were unsuccessful, despite favourable weather conditions. Since the weather is usually uncertain at the time that the weevils are beginning to oviposit, and they are emerging from hibernation over a long period, a contact poison is likely to give poor control, and the possibility of preventing oviposition by the use of repellent sprays was therefore investigated in both 1941 and 1942. Despite promising results in laboratory tests, none of the materials, which included β-naphthol, naphthalene, tetramethylthiuram

disulphide, paradichlorbenzene, hexachlorethane and lime-sulphur, gave protection in field trials ; the order of their apparent effectiveness differed according to whether it was based on the percentage of buds containing eggs or of capped blossoms, and these two methods of sampling are briefly discussed. Dusts of derris and pure silica and a spray containing 2 lb. derris and 5 lb. soft soap per 100 gals., were also ineffective.

Notes and Exhibitions [presented at meetings of the Hawaiian Entomological Society in 1944].—*Proc. Hawaii. ent. Soc.* **12** no. 2 pp. 213–233, 5 refs. Honolulu, 1945.

Three females of *Blondelia* (*Eucelatoria*) *armigera*, Coq., were reared from a larva of *Heliothis armigera*, Hb., on potato on Oahu in January 1943 ; this is the first record of this Tachinid parasitising *H. armigera* in the Hawaiian Islands. Adults were numerous in the potato field on 9th February, but none could be found about five weeks later. Two adults were reared from a well-developed larva of *Cirphis unipuncta*, Haw., on grass on Oahu in April 1944 [*cf. R.A.E.*, A **34** 171] ; the host was also parasitised by *Euplectrus platyhypenae*, How., which had been unable to develop in competition with the Tachinid larvae. Evidence of the establishment on Hawaii of *Apanteles marginiventris*, Cress., and *Meteorus laphygmae*, Vier., which were introduced to control Lepidopterous larvae [*cf.* **34** 3], was obtained in May 1944, and *A. marginiventris* was found on Kauai parasitising larvae of *Hymenia recurvalis*, F., on leaves of amaranth [*Amarantus*]. *Chelonus blackburni*, Cam., another parasite of Lepidopterous larvae [*cf.* **33** 250], was observed ovipositing in the eggs of a Syrphid predator of Aphis on maize on Oahu. Eight adults of the Coccinellid, *Scymnus uncinatus*, Sic., which was introduced from Mexico against mealybugs in 1922, were found on Hawaii in April 1944 ; this is the first published record of its establishment but it had previously been collected on Oahu, where three examples were taken attacking *Pseudococcus brevipes*, Ckll., on *Gliricidia* in 1941 and one attacking *P. filamentosus*, Ckll., on *Ceratonia* in 1927.

Adults of *Agromyza virens*, Lw., were reared from a stalk of celery on Hawaii in July 1941. The stalk showed a brown corky condition along the groove that may have been the cause and not the result of the infestation, since it resembled that due to boron deficiency. *Dendrothripoides ipomeae*, Bagn., which had been found on *Echinochloa crusgalli* in 1940 and on sweet potato in 1941, did severe injury to sweet potato on Oahu in 1942 and 1943, breeding in the young shoots and causing the leaves to be scarred and crinkled. It was also moderately injurious to lettuce near sweet potato on Oahu and was observed on sweet potato on Kauai in 1943. *Philaenus leucophthalmus*, L., the first Cercopid to be recorded in the Islands, was found on Hawaii in 1944. Adults occurred on daikon radish (*Raphanus sativus longipinnatus*) and leaves of satsuma orange in January and nymphs were numerous in April in a market-garden area, where they infested celery, parsley, strawberry, and many other plants, but were not found in other parts of the island. *Hercinothrips femoralis*, Reut., caused serious injury to banana fruits on Oahu. Shoots produced by dried onions that had been imported from California and kept in a screened cooler for a month were found to be infested by a large colony of *Idiopterus* (*Micromyzus*) *formosanus*, Takah., and it is suggested that this Aphid may have been introduced from California under the loose scales at the apex of onion bulbs ; it was found in a nursery on Hawaii in 1944 [*cf.* **33** 251] and a black Aphid, probably of the same species, had severely damaged a field of onions there in 1942. *Myzus ornatus*, Laing, was taken for the first time in the Islands in 1944, when it was found on celery on Oahu and on an unidentified composite plant on Hawaii.

Rabbit skins sent to the United States by air were found on arrival to be severely damaged by *Dermestes maculatus*, Deg. (*vulpinus*, F.) and *D. ater*,

Deg. (*cadaverinus*, F.). The skins are dried for four days prior to shipping, and investigation showed that it is during this period that they become infested. One package of 36 skins contained over 1,100 beetles. Several adults of *Trichophaga tapetzella*, L., which had not previously been recorded from the Islands, emerged from a skin infested by *Dermestes* that had been wrapped in paper and placed in a glass rearing jar.

A dust containing 3 per cent. DDT destroyed *Orchidophilus peregrinator*, Buchanan, on the orchid, *Vanda teres*, within 48 hours. Treatment of runways of *Kalotermes* (*Cryptotermes*) *piceatus*, Snyder, in a house with D-D (a mixture of 1, 3-dichlorpropene and 1, 2-dichlorpropane) controlled infestation, whereas treatment with orthodichlorbenzene did not.

BIANCHI (F. A.). **Introduction to the Thysanoptera of New Caledonia.**—*Proc. Hawaii. ent. Soc.* **12** no. 2 pp. 249–278, 14 figs. Honolulu, 1945.

An annotated list is given of 22 species of thrips and one variety collected in New Caledonia in July–November 1940, nine new species are described, and a new genus is erected for one of them. Those that were found in the spindles of sugar-cane and are therefore assumed to feed on this plant, are *Haplothrips gowdeyi*, Franklin, *H. angustus*, Hood, *Chirothrips aculeatus*, Bagn., *Anaphothrips swezeyi*, Mltn., *A. speciosus*, Hood, and *Diarthrothrips saccharicolus*, sp. n. *Thrips tabaci*, Lind., was taken on onion plants.

BIANCHI (F. A.). **Notes on Hawaiian Thysanoptera, with Description of a new Species.**—*Proc. Hawaii. ent. Soc.* **12** no. 2 pp. 279–286, 5 figs. Honolulu, 1945.

The Thysanoptera recorded in this paper from various plants in Hawaii include *Anaphothrips obscurus*, Müller, which damaged sugar-cane and Sudan grass [*Sorghum sudanense*] grown for experimental purposes in open greenhouses on Oahu in January 1941. Large numbers of winged females, larvae and eggs were present on the plants and necessitated the application of control measures. As a result of the feeding of the thrips, the leaves of Sudan grass became silvered, and the edges of those of young sugar-cane became red and partly curled.

HOLDAWAY (F. G.). **Research on DDT for the Control of agricultural Insects in Hawaii.**—*Proc. Hawaii. ent. Soc.* **12** no. 2 pp. 301–308, 5 refs. Honolulu, 1945.

An account is given of preliminary experiments with DDT against pests of vegetables in Hawaii; those against *Adoretus sinicus*, Burm., have already been noticed [*R.A.E.*, A **33** 217]. *Trialeurodes vaporariorum*, Westw., has recently become a serious pest of green beans on Oahu, Hawaii and Maui. A proprietary preparation containing 20 per cent. DDT, with wetting and spreading agents, added to a commercial white-oil emulsion diluted to 1 : 80, killed 19·2 per cent. of the nymphs when the content of actual DDT was 0·7 oz. per 100 U.S. gals. and 94·3 per cent. when it was 2·7 oz. In a second test, sprays containing DDT at the higher concentration with the oil emulsion at dilutions of 1 : 80 and 1 : 60 gave 96·4 and 97·9 per cent. control, respectively, in nine days. The DDT preparation used was not very suitable for addition to oil emulsion, as a scum rose to the top of the spray. In further tests, young uninfested leaves remained free from the adult whiteflies for four days and almost free for eight when dusted with 2 per cent. DDT, and uninfested leaves treated with a 1 per cent. dust or a spray containing 1 lb. actual DDT per 100 U.S. gals. water remained almost free for eight and six days, respectively. Leaflets each bearing at least 100 adults were almost free from infestation ten

minutes after treatment with the 2 per cent. dust, and only six adults remained on nine leaflets 37 minutes after treatment. The 1 per cent. dust had a similar effect, though its initial action was slower. Sprays apparently removed the adults by mechanical action. Nymphs that hatched from eggs present when either of the dusts or the spray containing 1 lb. DDT was applied, died in the first instar. Young nymphs were destroyed within four days by the 2 per cent. dust and within eight days by 1 or 0·5 per cent. dusts; a 2 per cent. dust killed all nymphs in six days. The spray and a dust containing 0·5 per cent. DDT gave complete mortality of pupae in some cases, but complete control was not obtained in others even with a dust containing 2 per cent. DDT; it is thought that mortality may be influenced by the age of the pupae.

Dacus cucurbitae, Coq., is a major pest of cucurbits and tomato and, at times, of green beans in Hawaii, and only cultural measures have hitherto been effective against it. It has been found that a bait-spray containing 2–4 lb. tartar-emetic per 100 U.S. gals. gives 50 and 100 per cent. mortality in averages of 47 and 96 hours, respectively, but the females oviposit before succumbing. When DDT was tested in a bait-spray, its action was much slower than that of tartar emetic. In later tests, flies confined with food and water in cages, the inside of which had been dusted with 1 or 2 per cent. DDT, began to fall to the floor 15 minutes after entering the cage, and all had fallen in three hours. Flies removed to a clean cage as soon as they fell did not recover; complete mortality occurred after 24 hours with the 2 per cent. dust and after 32 with the 1 per cent. dust. In similar tests with dusts containing 3 or 4 per cent. nicotine or 0·5 or 1 per cent. rotenone, the flies that came into contact with the nicotine soon fell, but later revived, and those that came into contact with the rotenone were only slightly affected. In other tests, half-grown cucumbers were dusted with 2 per cent. DDT and put in cages with 50 flies, of which about half were females. No larvae were found during subsequent examination of the cucumbers, whereas 32 larvae were found in the controls. Preliminary tests of DDT dusts in the field also gave promising results.

Engytatus geniculatus, Reut. (*Cyrtopeltis varians*, Dist.) attacks tomatoes at low altitudes, causing the flowers to fall, and is especially injurious during the summer. It has been present in Hawaii since 1924, but has become of increased importance since the introduction of a variety of tomato suitable for lowland districts. It is effectively controlled by dusts containing various contact insecticides, of which nicotine at a concentration of 3·8–4 per cent. has been the most extensively used, but they have to be applied at 5-day intervals during the period in which flowers are present and the fruit setting. Dusts containing 1 or 2 per cent. DDT or the spray containing 1 lb. per 100 U.S. gals. not only gave satisfactory immediate control, but also prevented the eggs from hatching or destroyed the nymphs shortly after, and afforded protection for a longer period. *Heliothis armigera*, Hb., which is also a major pest of tomato in Hawaii, was not injurious on plants that had been dusted with DDT.

SAKIMURA (K.) & KRAUSS (N. L. H.). **Collections of Thrips from Kauai and Hawaii.**—*Proc. Hawaii. ent. Soc.* **12** no. 2 pp. 319–331, 13 refs. Honolulu, 1945.

This paper contains lists of Thysanoptera collected in 1944 on Kauai between 6th and 20th January and on Hawaii between 11th April and 2nd May. The 16 species from Kauai include *Thrips tabaci*, Lind., on peas and cruciferous vegetables, *Organothrips bianchii*, Hood, moderate infestations of which were found on both the commercial plantings of taro [*Colocasia*] examined, and *Chirothrips spiniceps*, Hood, *Plesiothrips panicus*, Mltn., an undescribed species of *Anaphothrips*, *Frankliniella flavens*, Mltn., and *Thrips saccharoni*, Mltn., all

on maize. Recent observations on Oahu have shown that *O. bianchii* is always present on wetland taros, but does not occur on dryland taros, even when these are growing in moist areas. None of the species on maize was represented by more than three examples and the species of *Anaphothrips* is recorded on several other plants on Oahu. *F. flavens*, however, which was previously known only on Oahu, is very common on maize in that island. It breeds freely in the rolled heart leaves of the young plants and in the space between the overlapping husks of young or mature ears, increases in numbers during the winter, and prefers a moist habitat. It also attacks sorghum and occurs in relatively small numbers on *Panicum purpurascens*, the only wild food-plant known.

The 14 species from Hawaii include *Heliothrips haemorrhoidalis*, Bch., on azalea, rose and *Styphelia* sp., *Selenothrips rubrocinctus*, Giard, on azalea, and *Thrips nigropilosus*, Uzel, on *Arctium lappa*, all of which are recorded from these food-plants for the first time, *T. hawaiiensis*, Morg., on squash and Easter lily [*Lilium longiflorum*], *T. tabaci* and *Taeniothrips alliorum*, Priesner, on onions, and *T. simplex*, Morison, on *Gladiolus*. *Thrips nigropilosus* also occurs on Oahu, Kauai and Maui and sometimes injures lettuce in upland and damp districts during winter; in February 1943, it severely damaged seedling asters on Maui. A list of the 26 species of thrips known to occur on Hawaii is given, and the number is increased to 30 by a supplementary list of seven species, based on material collected on Hawaii in February–March 1945, which also includes records of *H. haemorroidalis* and *S. rubrocinctus* on leaves of rhododendron and passion fruit [*Passiflora edulis*], respectively.

SWEZEY (O. H.). **Insects associated with Orchids.**—*Proc. Hawaii. ent. Soc.* **12** no. 2 pp. 343–403, 11 figs., 20 refs. Honolulu, 1945.

An annotated list is given of insects associated with orchids, based on the published lists of interceptions at ports of entry into the United States, records in this *Review* up to 1940 and other literature. The information on the various species includes in most cases the name of the orchid attacked, the country and, for intercepted species, its country of origin, and in some, notes on the general distribution and habits of the insect, the part of the plant attacked by it and its economic importance. Beetles and thrips that are present on orchids only incidentally are distinguished from those that feed on them, and Coccids that feed chiefly or solely on orchids from those that also attack other plants. A list of insects observed or thought to pollinate orchids is appended.

TAYLOR (T. H. C.). **Recent Investigations of *Antestia* Species in Uganda.**—*E. Afr. agric. J.* **10** no. 4 pp. 223–233; **11** no. 1 pp. 47–55, 1 map, 8 refs. Nairobi, 1945.

This is a report on work done in Uganda, mainly in 1940–42, on *Antestia* spp. and their parasites, with a view to the control of *A. faceta*, Germ., and *A. lineaticollis*, Stål, on coffee [*cf. R.A.E.*, A **29** 229], particularly in small, African-owned plots. Four other species, *A. cincticollis*, Schaum, and three that are undetermined, occur in Uganda but are uncommon; the plants on which they breed are unknown, but adults of *A. cincticollis* are found on composite flowers and occasionally on coffee.

A. faceta and *A. lineaticollis* inhabit different types of country, the former occurring mainly in the east and north in the neighbourhood of dense forest and the latter mainly in a more open and drier type of country in the south-west, but both have extended their range, owing to the cultivation of coffee, to areas in which they are probably not indigenous. There are very few localities in which both occur together and only one considerable area, at the southern extremity of the Ruwenzori Range, in which both are absent. The

wild plants on which *A. faceta* and *A. lineaticollis* breed are restricted to the Rubiaceae but include species of several genera, of which *Canthium* and *Pavetta* are probably the most important for *A. faceta* and *Pavetta* and *Galiniera* for *A. lineaticollis*. Of the coffees, arabica is a major food-plant, while robusta is seldom severely attacked except in special conditions; the wild coffees (three species) are probably food-plants.

The primary egg parasites of *Antestia* in Uganda are the Pteromalid, *Acroclisoides africanus*, Ferrière, the Eupelmid, *Anastatus antestiae*, Ferrière (previously referred to in error as *A. bifasciatus*, Boy., and an unidentified Eupelmid [**29** 80, 230]), and the Scelionids, *Hadronotus antestiae*, Dodd, *Microphanurus mopsus*, Nixon, *M. seychellensis*, Kieff., and *M. suranus*, Nixon. Hyperparasites obtained from the eggs comprise three Eulophids (*Aprostocetus* sp. and *Pleurotropis* spp.) and a Scelionid of the genus *Baryconus*. The nymphs are parasitised by the Braconids, *Aridelus* (*Helorimorpha*) *coffeae*, Brues, and *A. taylori*, Nixon [**30** 210]. The Strepsipterous parasite, *Corioxenos antestiae*, Blair [*cf.* **26** 179] attacks the nymphs but matures in the adults, and the Tachinid, *Epineura rubens*, Villen., parasitises the adults. The primary egg parasites, with the exception of *Hadronotus antestiae*, are present in all the coffee-growing areas and, unlike the parasites of the nymphs and adults, are known to have Pentatomid hosts of genera other than *Antestia*. *H. antestiae*, which was one of the commonest of them prior to about 1928, is now one of the rarest, having apparently disappeared from many localities in which it was formerly plentiful. The two species of *Aridelus* are widely distributed and at least one is present in almost every district. *Corioxenos antestiae* was confined to western districts until it was introduced for experimental purposes into Bugishu (the district that includes Mount Elgon). Its natural distribution in Uganda is such that its host is usually *A. lineaticollis*, but it attacks *A. faceta* and *A. cincticollis* readily where these two species are present within its range. *E. rubens* occurs in forest country in central and western Uganda, but is absent in the east and south-west. Its natural habitat is that of *A. faceta*, which is therefore its principal host, but its range is much less extensive; in the few localities where *A. faceta* and *A. lineaticollis* occur together it attacks the latter also.

The economic value of the egg parasites is very great, though they do not maintain satisfactory control. They are particularly effective in small coffee plots in which other parasites (except *Aridelus*) have difficulty in surviving. The presence of at least one species in every plot is ensured by the existence of alternative hosts in the surrounding vegetation. Two or more species usually occur together, causing continuous destruction of *Antestia* eggs throughout the year. Their efficiency probably cannot be increased by introducing them from one area to another, since several species occur in all districts, or by releasing adults in large numbers from host eggs parasitised in the field, but pruning the coffee trees in such a way as to make them more open increases the percentage egg-parasitism, especially if a moderate growth of weeds is permitted. In suitably-pruned, small plots, the percentage of eggs parasitised often exceeded 90, whereas it rarely exceeded 50 in unpruned plots nearby. In large plantations, this effect of pruning is less marked.

Almost 100 per cent. parasitism of nymphs of *Antestia* by one or both species of *Aridelus* was frequently observed and probably occurs from time to time in all localities, but further investigation is required to ascertain their true value. They oviposit in young nymphs, and the fully grown larvae emerge from large nymphs and occasionally from adults; only one parasite develops in each individual host. Pupation takes place in a white cocoon and the period spent in the cocoon varies from three to four weeks [*cf.* **26** 179].

The principal economic rôle of *C. antestiae*, the general distribution of which is facilitated, at least in some districts, by the presence of *A. cincticollis* as a host as well as the coffee-frequenting species of *Antestia*, is the shortening of

the periods of abundance of *Antestia* on coffee. It is relatively scarce so long as its host is scarce, but attains a high percentage parasitism as soon as its host becomes abundant [*cf.* **29** 590]. *Aridelus* spp. and *E. rubens* can cause relatively heavy parasitism in an *Antestia* population of ten (nymphs and adults) per large coffee bush, but *C. antestiae* is almost negligible in such a population and requires one of the order of 50 per bush to be effective. It was introduced into three localities in which it was previously absent ; one introduction was made in 1940 in Toro, a western district, and the other two in 1942 in Bugishu. It was successfully established in the first locality and one of the two others, but the results of these introductions, which were regarded as experimental, could not be judged until more time had elapsed.

E. rubens maintained satisfactory control of *A. faceta*, on various coffee estates in a central district in which it is indigenous, for a four-year period of observation and probably much longer. It was similarly effective on an estate in another central district for several successive years, and on an estate in Toro it was the principal factor in terminating a severe outbreak in 1940. There are strong indications, from early records, that it established itself naturally on these and other estates after many years of absence, owing to certain changes in agricultural practice ; the conclusion is drawn that its utilisation is the most satisfactory method of control in large areas of coffee, but that a suitable ground-cover of weeds or mulch is essential, clean-weeding being fatal to the puparia in dry weather, and that shade is desirable.

The success of *E. rubens* against *Antestia* is achieved by constant moderate parasitism rather than periodic heavy parasitism. Its effect is cumulative during the dry season, when the breeding of *Antestia* is much reduced so that the population consists largely of adults. The failure of the egg parasites and *Aridelus*, valuable though they are, to maintain continuous control is due mainly to the periodic scarcity of the stages of their host that they require, and *E. rubens* is effective during these periods and completes the sequence of attack by parasites. The degree of control achieved by *E. rubens* on estates with suitable ground treatment is such that the *Antestia* population is maintained at about two per tree on the average, and this is considered preferable in practice to the greater reduction that might be obtained by laborious and costly chemical methods [*cf.* **29** 589]. Numerous attempts to establish *E. rubens* in small coffee plots, as opposed to large estates, were unsuccessful (with one exception), and it is tentatively concluded, pending further recommended experiments, that the conditions prevailing in most small plots are unsuitable for it.

The adult life of *E. rubens*, which is relatively lethargic and delicate for a Tachinid, varied from three to 23 days in the laboratory, and is probably three or four weeks in the field. Laboratory observations indicated that the number of eggs laid per female in the field is between 50 and 100. They are laid singly, normally on adult *Antestia*, but occasionally on nymphs, and only one parasite can develop in each host. The host dies soon after the larva leaves it for pupation, which takes place in the soil. The pupal stage lasted 15–21 days in the laboratory. The period from the deposition of the egg to the escape of the larva averaged 23·2 days for 154 individuals in *A. faceta*, and the rate of development in *A. lineaticollis* was similar.

Observations in localities in which *A. faceta* and *A. lineaticollis* occur together indicated that the former suffers heavier parasitism by *E. rubens* than the latter, but that the total *Antestia* population is maintained at about the same level as where *A. faceta* occurs alone.

In discussing the prospects of controlling *Antestia* in small, African-owned plots, the author concludes that a population of five per tree, though not low enough to obviate damage, should be regarded as satisfactory control in view of the difficulties involved in any procedure advocated for such plots, especially the apathy of growers.

COLLETT (R. W.). **The Destruction of Locusts by Beating.**—*E. Afr. agric. J.* **11** no. 1 pp. 35–36. Nairobi, 1945.

The author describes a method of destroying locust hoppers by means of flails; it was applied under his supervision during two locust invasions in coastal districts of Tanganyika Territory and reduced the hopper bands sufficiently to enable natural enemies to prevent the formation of flying swarms. The work is done 3–4 days after hatching begins; if it is started earlier, hoppers that hatch late may escape. Tough, pliable sticks, tied together at one end in bundles of about 20, or, where there is no long thick grass to be beaten down, leaves of *Hyphaene miyaa*, which split into numerous narrow strips during use, were found to be the most effective flails. Scouts locate the bands of hoppers so that they can be dealt with one after another. The beaters encircle a band and then move forward slowly and evenly towards the centre of the circle, gently brushing the grass as they go. The area originally enclosed should not exceed about 30 yards in diameter, and at least 50 men are needed for a ring of this size. As the ring becomes smaller, some men drop out and form a second, outer ring. When the inner ring is about six yards across, beating starts, and the men continue to move forward until the flails meet across the centre. Hoppers that escape the first ring are dealt with by the second. It is important not to drive the hoppers too far or too fast, and the treated area should be examined for survivors after a day or two.

HENDRICKX (F. L.). **Une épidemie fongique de criquet *Zonocerus variegatus* L. due à *Empusa grylli* (Fres.) Nowak.**—*Rec. Commun. Inst. nat. Etude agron. Congo belge* no. 1 pp. 16–20, 3 figs., 6 refs. [Yangambi] 1943.

Zonocerus variegatus, L., caused important damage, especially to cotton and *Pennisetum*, in fields at the experiment station at Bambusa during the dry season from December 1939 to March 1940. All the grasshoppers were in the nymphal stage at the beginning of this period, but some had become adult at the end of it. At the beginning of the rainy season, after the end of March, the population diminished rapidly, and both adults and nymphs were found to be infested with *Empusa grylli*, which had not previously been recorded in the Belgian Congo. Infestation by this fungus, the symptoms of which are described, is most likely to spread at night when the grasshoppers are assembled in groups and the relative humidity reaches 100 per cent.; the presence of dew renders its dissemination in the morning less likely. Observations on its morphology and development of the fungus are given; attempts to cultivate it on artificial media in the laboratory were unsuccessful. No evidence was obtained of the presence of resting spores within the bodies of dead grasshoppers [*cf. R.A.E.*, A **13** 527], possibly because the observations were made during the rainy season. The fungus cannot be obtained in pure culture, and there is little prospect of its being of value as a means of biological control.

STOFFELS (E. H. J.). **L'improductivité des caféiers Arabica dans le Kivu Nord.**—*Bull. agric. Congo belge* **32** no. 1 pp. 59–69, 10 figs., 5 refs. Brussels, 1941.

The factors that have rendered arabica coffee unproductive in northern Kivu are discussed in some detail. The soil and seasonal climate induce vigorous vegetative growth, which does not favour fruit production, and though numerous flower buds are formed, they fail to develop. This is attributed in part to lack of light and air resulting from the vigorous growth and in part to infestation by *Antestia* [*cf. R.A.E.*, A **31** 519–521], which in some plantations is present on every branch, and *Lygus*. In addition to destroying the berries, attack by *Antestia* prevents the normal development of the fruit-bearing branches and causes a proliferation of small shoots, thereby increasing

the shrubby habit. The recommended measures to counteract these defects comprise pruning the plants on a system of several main stems instead of only one, thus permitting the entry of light and air, reducing insect populations and increasing the effectiveness of insecticides, and the regular application of pyrethrum dust against *Antestia* and *Lygus*.

FALLON (Baron F.). *Derris* et *Lonchocarpus*. **Insecticides végétaux.**—*Bull. agric. Congo belge* **32** no. 1 pp. 112–125, 2 figs. Brussels, 1941.

This paper contains notes on the appearance and distribution of the species and varieties of *Derris* and the species of *Lonchocarpus* from which rotenone is obtained, and on the cultivation of these plants, the harvesting of the roots, their toxic constituents, the content of rotenone and total extractives in roots of different varieties of *Derris*, and the various types of insecticides prepared from the roots. The relative usefulness of roots with high and low rotenone content, and the factors affecting the prices offered in world markets for rotenone-bearing roots are briefly discussed.

TILEMANS (E.). **Les légumineuses insecticides.**—*Bull. agric. Congo belge* **32** no. 1 pp. 126–193, 6 figs., 303 refs. Brussels, 1941. (With a Summary in Flemish.)

The author gives a comprehensive account of the cultivation of rotenone-bearing plants, notably species of *Derris* and *Lonchocarpus*, for the preparation of insecticides, with special reference to the possibilities of encouraging the growth of these plants in the Belgian Congo. He also gives information on the treatment of the harvested roots and their commercial value, various methods of sampling the roots for rotenone or total extractives and of estimating their insecticidal value by biological assay, the toxicology of rotenone and the susceptibility of numerous insects to sprays and dusts of the ground roots or to extracts of them.

DE SAEGER (H.). **Les *Apanteles*, Hyménoptères, Braconides, parasites de Lépidoptères.**—*Bull. agric. Congo belge* **33** no. 2–3 pp. 234–288, 2 pls., 5 figs., many refs. Brussels, 1942.

This review of information on the genus *Apanteles* is based on the literature and the author's observations in the Belgian Congo. It includes discussions of the morphological groups into which the genus has been divided, the morphology of the various stages, and the bionomics, parasites, hosts and ecology of these Braconids, with references to individual species. The geographical distribution of the genus is briefly reviewed, and it is concluded that the species of the Ethiopian region form a distinct faunistic group; 78 have been described, and six others are known from the Belgian Congo. A list of these 84 species is appended, showing their distribution and hosts and the food-plants of the latter.

BAPTIST (B. A.). **The Fruit-piercing Moth (*Othreis fullonica* L.) with special Reference to its economic Importance.**—*Indian J. Ent.* **6** pt. 1–2 pp. 1–13, 13 refs. New Delhi, 1945.

The most injurious of the fruit-piercing moths that occur in Ceylon is *Othreis fullonia*, Cl. (*fullonica*, L.); *O. ancilla*, Cram., and *Eumaenas* (*O.*) *salaminia*, Cram., are less common, and *O. materna*, L., *O. hypermnestra*, Cram., and *O. aurantia*, Moore, are comparatively rare. The observations in this paper are chiefly confined to *O. fullonia*, but may be taken as representing the problem presented by the whole group. *O. fullonia* has been found attacking the fruits of all varieties of *Citrus*, except the local sour lime, and also those of mango,

cashew [*Anacardium occidentale*] and banana in Ceylon, where the favoured food-plant of the larva is said to be a species of *Anamirta* [*cf. R.A.E.*, A **30** 338]. The eggs are deposited singly on the underside of rather mature leaves and hatch in 2–3 days, and the larvae feed on the tender leaves and pupate among the mature ones. The egg, larval and pupal stages last 2–3, 17–20 and 14–16 days, respectively. The moths attack fruits during the night and shelter in the jungle or any dense undisturbed vegetation near the orchards during the day. They are most active during the earlier part of the night and may fly long distances in search of food. They usually feed on mature or ripening fruits, but attack immature ones if no others are available. They do not normally feed on fallen fruits, but the odour of fallen and decaying fruits attracts them to the orchard from great distances. Mating takes place after a certain amount of flying and feeding.

The only natural enemies recorded in Ceylon are an unidentified Braconid parasite of the larvae and an unidentified Chalcidoid egg parasite. They appear to be of no importance, and it is probable that fluctuations in the numbers of moths are associated with abundance or scarcity of tender foliage on the food-plants of the larvae. In the dry zone, such foliage is abundant only from October to December and is practically absent during February–April. In the intermediate and wet zones, it is probably available for much longer, and its relative scarcity is appreciable only during February–March and August–September. Observations over a number of years in orchards in various parts of the island showed that the population of moths rises rapidly in November–December and to a less extent in June–July, coinciding roughly with the latter part of the normal fruiting seasons of *Citrus*. The population density normally decreases appreciably from the wet and intermediate zones to the dry zone.

Recommended control measures include the use of a poison bait consisting of a mixture of 6 pints water, 2 pints fruit pulp or extract, ½ lb. crude sugar and 1 oz. sodium arsenite, sodium fluosilicate or lead arsenate. If, however, the bait containers are deep jars with narrow necks, the moths do not escape from them and poison is unnecessary. The bait is more effective if a fruit different from that in the orchard is used ; the containers should be hung among the branches at the rate of 16 or more per acre for 1–2 months before the expected cropping season. As soon as damage becomes noticeable, baiting should be discontinued and smoking the orchard begun. Burning a mixture of oil, tar and coconut husks or similar material under a layer of green leaves in a perforated container produces a copious and steady smoke that masks the odour of the fruit, particularly if seed of margosa [*Melia azadirachta*] is added to the mixture. Fires should be lit at the rate of 2–4 per acre at least half an hour before dusk and kept burning for 2–3 hours after nightfall, according to the numbers of moths. Covering individual fruits or bunches with stout paper bags is completely effective and frequently practicable where valuable fruit is grown, and the hand collection of feeding moths gives some control in seasons of mild infestation, but light-traps and deterrent sprays proved ineffective. If the value of the crop is too small to merit control measures, or if the attack persists in spite of them, the whole crop should be harvested as soon as the fruit is mature enough to ripen in storage. Whatever control measures are used, all injured and fallen fruits should be collected and disposed of so that their odour will not attract moths to the orchard.

HAROON KHAN (M.). **Studies on *Earias* Species (the Spotted Bollworms of Cotton) in the Punjab. Part I. The relative Abundance of *E. fabia* Stoll and *E. insulana* Boisd. in various Parts in Relation to environmental Conditions.**—*Indian J. Ent.* **6** pt. 1–2 pp. 15–27, 33 refs. New Delhi, 1945.

The following is based on the author's summary of this account of investigations on the distribution of *Earias fabia*, Stoll, and *E. insulana*, Boisd., on

cotton in the Punjab, carried out at several localities in the Province in 1932–36. Both species probably occur throughout the Punjab, although only *E. insulana* was taken at Lahore [*cf.* *R.A.E.*, A **28** 562], but the proportions vary in different localities, years and months. *E. insulana* is much the more important pest. *E. fabia* is common and of some importance as a pest only in parts of the south-eastern, central and sub-mountainous (eastern) regions, where it may outnumber *E. insulana* during less than a quarter of the year. Rainfall and temperature probably influence the relative abundance of the two species; *E. fabia* is rare in the places where there are great extremes of temperature and is common elsewhere only during some months in the monsoon season, when there is good rainfall and a sudden drop in summer temperatures. This effect of climate is supported by a study of the distribution of the two species outside the Punjab. *E. fabia* is restricted to India and parts of south-eastern Asia where the climate is comparatively humid and mild, whereas *E. insulana* is widely distributed in western Asia and Africa and is found under severe and diverse climatic conditions.

PADMANABHA AIYER (K. S.). **Notes on the Life History and economic Importance of a Bagworm** (*Pteroma* **sp.**) **in Travancore.**—*Indian J. Ent.* **6** pt. 1–2 pp. 29–34, 7 figs., 7 refs. New Delhi, 1945.

Descriptions are given of all stages, including pupae and adults of both sexes, of a Psychid that is provisionally referred to the genus *Pteroma* and of which larvae were numerous on pomegranate plants in a garden in Travancore in January 1942. They caused appreciable damage to the lower surfaces of the leaves by scraping off the superficial tissue and thus producing numerous white dry patches. Investigations on the bionomics indicated that reproduction is parthenogenetic. The female oviposits within the pupal case, gradually emerging from it as it gets fuller of eggs, and is almost dead by the time the larvae hatch, 5–7 days later. The larvae leave the pupal case in a swarm and soon begin to construct cases of their own. They mature in five weeks and then fix and close their cases before pupating in them. The females transform to adults about five days later and the males about 15 days later. A single example of an undetermined Braconid was reared from one of the larvae.

This Psychid is unlikely to be of economic importance and could easily be controlled by hand-picking.

JONES (S.). *Prodioctes haematicus* **Chevr., a new Weevil Pest of Cardamom in South India.**—*Indian J. Ent.* **6** pt. 1–2 pp. 49–52, 6 figs., 3 refs. New Delhi, 1945.

Prodioctes haematicus, Chevr., which was found attacking cardamom [*Elettaria cardamomum*] in Travancore in 1940 [*cf.* *R.A.E.*, A **30** 303], has already done considerable damage in the worst-affected area, and a preliminary study indicated that it would become a serious pest in time if left uncontrolled. Cardamoms are subject to a clump-rot disease known locally as " damping off " and characterised by discoloration of the rhizome tissue and falling of the pseudostems, which are easily broken from the clumps. When it sets in, the raceme production is retarded, and there may be a tendency to excessive tillering; in severe cases the whole clump dies. In 90 per cent. of hundreds of diseased clumps examined, at least one of the 15–20 rhizomes was tunnelled by larvae of *P. haematicus*; 30 per cent. of the diseased rhizomes were tunnelled and the rest were connected with tunnelled ones. A definite relationship between clump-rot and the weevil is not known, but the rot develops along the tunnel of the larva and spreads gradually throughout the rhizome and the pseudostem and finally to the connected rhizomes until the whole clump becomes diseased.

The adult weevils usually remain at the base of the plant, except for about two months after the early monsoon showers in April, when they are found in large numbers on the leaves and shoots. They mate much more during this period than at other times and then move down to the base clumps and oviposit. The eggs are laid at night in feeding punctures made by the female on the rhizome. One egg is laid at a time, and not more than one or two are laid by a single female in one clump. The larva hatches in 8–10 days and tunnels up and down within the rhizome, usually going up for 1–2 ft. above ground level into the pseudostem ; it tunnels into associated rhizomes if there is insufficient food in the first. It pupates in its tunnel after three months, and the pupal stage lasts about 20 days. The adults leave the tunnels three days after emerging and feed on the rhizomes and pseudostems and occasionally on leaves. They live for 6–8 months, the females longer than the males.

No parasites were found, but ants, earwigs and centipedes feed on the grubs in the rhizome tunnels. The removal and scorching of clumps affected by clump-rot has been practised since 1940, but though this would kill any grubs inside, the adults have usually left the rhizomes before the symptoms of the disease are externally evident. Hand-picking large numbers of the adults on the leaves in April and May 1941 appeared to reduce the incidence of clump-rot disease in 1942.

TASKHIR AHMAD & GHULAMULLAH. **Ecological Studies on the Spotted Bollworms of Cotton and their Parasites. III.—The Development and Fecundity of *Melcha nursei* Cam., a pupal Parasite of *Earias* spp.**—*Indian J. Ent.* **6** pt. 1–2 pp. 53–59, 1 pl., 4 refs. New Delhi, 1945.

Goryphus (*Melcha*) *nursei*, Cam., is common as a pupal parasite of *Earias* spp. in northern India but not in the south, where these bollworms pupate in the soil. Little is known of its life-history, however, and studies of its fecundity and development under controlled conditions of temperature and humidity were therefore carried out at New Delhi [*cf. R.A.E.*, A **28** 1 ; **29** 183]. It was found that the eggs are deposited on prepupae and pupae in their cocoons and that the female stings and paralyses a large number of hosts before ovipositing on some of them. As many as eight eggs were found on a single host, but only one or occasionally two of the resulting larvae completed their development. All the immature stages are passed inside the host cocoon.

The preoviposition period was 1–2 days at temperatures of 25, 30 and 35°C. [77, 86 and 95°F.] and 2–3 days at 16°C. [60·8°F.]. At constant temperatures of 16, 25, 30 and 35°C., respectively, the average durations of adult life were 57, 21, 13·3 and 10·5 days for females and 26·6, 17, 12 and 7·6 days for males, the average numbers of hosts paralysed per female and (in brackets) paralysed without oviposition were 90 (43), 68 (15·5), 50·3 (12·6) and 30 (10·6), and the average numbers of eggs laid per female were 101, 90, 75 and 37 ; 16°C. seemed to be the optimum temperature, and this is probably why the parasite is very active at Delhi from October onwards and is rarely met with in summer. Eggs hatched at 16°C., but not at 13°C. [55·4°F.]. The incubation period varied considerably with temperature, averaging 2·72, 2·19, 1·08, 0·8 and 0·92 days at 16°C., 20°C. [68°F.], 25, 30 and 35°C. at a saturation deficiency of 3 mm. It was usually longer at saturation deficiencies of 0 or 14 mm., but dry conditions seemed to have less adverse effect on the parasite than on the host. At a saturation deficiency of 3 mm., the larval stage averaged 8·6, 6·3, 4 and 3 days at 16, 20, 25 and 30°C. At 35°C., the hosts were attacked by fungi and the parasite larvae died at saturation deficiencies of 0 or 3 mm. ; a few larvae at 14 mm. pupated after an average larval period of 3·97 days. In general, a saturation deficiency of 3 mm. was more favourable to larval development than 0 or 14 mm. The pupal stage lasted 28·2, 16·5 and 7·8 days at 16, 25 and 30°C., but no pupae survived at 35°C. ; a saturated atmosphere was most suitable for

pupal development. Only 5 per cent. of the adults reared were females, possibly because of parthenogenetic reproduction due to poor facilities for mating under laboratory conditions.

The value of this parasite in the field is reduced by the narrowness of the range of temperature that is favourable for its development, since the boll-worms develop almost normally at 35°C., but is increased by the fairly long life of the females and their habit of killing more hosts than they use for oviposition.

RAHMAN (K. A.) & ABDUL LATIF. **Biology and Description of various Stages of *Drosichiella tamarindus* (Gr.) (Coccidae : Homoptera).**—*Indian J. Ent.* **6** pt. 1–2 pp. 79–86, 6 figs., 5 refs. New Delhi, 1945.

In the course of investigations begun in 1940 *Drosichiella* (*Monophlebus*) *tamarindus*, Green, was collected in the Punjab from 11 different plants, including *Grevillia robusta*, fig, *Citrus* and banana. Serious damage by this Coccid has not been reported, but a single 5-year-old *Grevillia* tree was killed by a heavy infestation. During August–September, the females crawled down the trees, oviposited at a depth of 2–6 inches in the soil and then died. The egg stage lasted from September to April in the field. Nymphs were common during May and June, and the pupae of the males from mid-June to mid-July. Male and female adults were present from the end of June to the end of July, and the females continued to feed on the plants until August. At a constant temperature of 25°C. [77°F.], 614 females deposited 91–316 eggs each, completing oviposition in 52 days, the egg stage lasted 141 days and the three nymphal instars were completed in 40–65 days. The third-instar male nymph secretes threads to form a cocoon in which it remains quiescent for 3–5 days before pupating ; the pupal stage lasted 10–14 days. The adult males lived for 4–7 days and the females for 59–81 days. All stages are described.

CHATTERJEE (P. N.). **On the Biology and Morphology of *Euplectrus parvulus* Ferr. (Hymenop : Eulophidae).**—*Indian J. Ent.* **6** pt. 1–2 pp. 95–101, 8 figs., 10 refs. New Delhi, 1945.

Euplectrus parvulus, Ferrière [*R.A.E.*, A **29** 514], of which *E. plecopterae*, Mani [**32** 393] is stated to be a synonym, is a gregarious primary ectoparasite of the larva of *Plecoptera reflexa*, Gn., on *Dalbergia sissoo* in India. It has also been recorded as a parasite of *Tephrina disputaria*, Gn., on *Acacia*, and *Boarmia* (*Ascotis*) *selenaria imparata*, Wlk., on *D. sissoo* and *Melia azedarach*, and was reared in Burma from an unidentified Pyralid on *Stephegyne diversifolia* [**29** 514]. The author gives the results of observations on its biology as a parasite of *P. reflexa* at Allahabad and Dehra Dun, and describes the immature stages and the processes of mating and oviposition. The female inserts the ovipositor into the body of the host and then withdraws it and deposits an egg externally at the point of insertion, where fluid from the wound solidifies and holds it in position. A female may lay more than one egg on one host; one laid 52 eggs in seven days distributed over 25 larvae, and another laid 50 in ten days on the same number of hosts. Most eggs are laid in June, July and October. After repeated oviposition the female paralyses a young larva with repeated pricks from the ovipositor and sucks it dry ; larvae used for feeding are not used for oviposition. The egg, larval and pupal stages lasted about 1, 2½ and 3½ days at Dehra Dun in June and July and 1–4, 3½–8 and 4½–20 days at Allahabad in September–December. The duration of life of adults in the laboratory varied from 17 and 15 days in May and June to 99 in January–April. Both adults (49 females and 11 males) and pupae (31) survived 13 days of cool storage (at about 8–15°C. [46·4–59°F.]), but three host larvae died in 24 hours and parasite eggs and larvae failed to develop on them. The parasite develops most readily on host larvae in the second instar ; host larvae in the first instar do not survive the ovipositor prick and larvae from eggs laid on them soon die of

starvation. The third-instar larvae are sometimes able to shake off the eggs or may shed the parasite when moulting, and the fourth and fifth instars are too strong for the adult parasite and are not attacked. Laboratory and field observations showed that up to six parasites could mature on a single host, but when hosts and parasites were caged together, as many as 20 eggs were deposited on one caterpillar. On three occasions females oviposited on collected host larvae from which the internal parasites *Rogas plecopterae*, Chatterjee, *Microgaster plecopterae*, Wlkn., and *Apanteles* sp. subsequently emerged, indicating that they are unable to distinguish between parasitised and unparasitised host larvae.

MATHUR (R. N.). **Interruptions on High Tension Cables by Insects.**—*Indian J. Ent.* **6** pt. 1–2 pp. 117–120. New Delhi, 1945.

Late in 1930, insulators supporting high-voltage transmission cables carrying 37,000 volts and extending over several hundred miles in the United Provinces were damaged by short circuits, owing to the swarming of insects on them. The injury occurred where the lines passed over a thickly cultivated sugar-cane tract, and the interruptions were frequent and serious in the early morning during October–December, when sugar-cane begins to mature, several insulators becoming useless in a night. It was found that a species of *Chlorops* was the main cause of the trouble.

The early stages of Chloropid flies are usually passed in decaying vegetable matter ; in this case, they occurred in sugar-cane stems that had been riddled by borers. The adults fed on the sugary excretions of species of *Pyrilla* in the cane-fields during the day and began to swarm in large numbers in the evening and settle on the shady underside of the insulators, cross-bars and verticals. They spread gradually all over the insulators as dusk approached and remained there throughout the night. In the morning they assembled on the under side of the insulators and cross-bars on account of the dew and then flew down in small batches to the sugar-cane fields to feed. The cross-bars and verticals on which they settled had been painted with white aluminium paint, and the insulators were made of white porcelain. The numbers of flies were considerably reduced and they did not swarm along the whole length of the line during the latter half of November. They preferred certain of the standards and visited them night after night, and they congregated on the insulators whether the lines were live or not. The short circuits were usually due to the coating of the insulators with the excrement or regurgitation of the flies, which increased every night until a thick coating was formed ; the deposit consisted largely of sugars of a deliquescent nature, which absorbed moisture to form a continuous conducting layer. This resulted in constant disturbances, culminating in interruptions of the circuit. Momentary interruptions might be caused by the contact formed by the congregation of flies settled over the insulators resulting in dangerous surges of electricity along the wires ; when there is a leakage on several insulators at the same time, the cumulative effect causes a " trip " in the circuit-breaker at the power station.

Experiments showed that alternative swarming places, such as dummy insulators and enamelled tin shelters on cross-pieces of the standards and on poles, were less attractive than the insulators, that the flies were not attracted to sweet baits or strong lights on the standards, and that fly-papers tied near the insulators were also ineffective. Insulators painted chocolate, green, blue and red were less attractive to the flies, in that order, than white ones near them, and black ones were almost entirely avoided. In tests of repellents in small shallow containers clamped round the insulator pins, furnace oil and creosote were most effective, but all repellents tend to be washed away by rain, so that repeated treatment would be required, necessitating the closing down of the line for a long period. However, it is suggested that either all the insulators

in the sugar-cane area should be fitted with containers filled with an oil repellent at the beginning of the winter season or else those that prove to be affected by the activity of the flies should be treated. The latter would also allow an extensive trial of the efficiency of the measure. The use of coloured insulators should also be considered.

HAROON KHAN (M.) & ABDUL GHANI (M.). **Studies on *Earias* Species (the Spotted Bollworms of Cotton) in the Punjab. Part II, The Crossing of *E. fabia* Stoll and *E. insulana* Boisd.**—*Indian J. Ent.* **6** pt. 1–2 pp. 133–138, 2 refs. New Delhi, 1945.

In the course of investigations on *Earias fabia*, Stoll, and *E. insulana*, Boisd., in the Punjab [*cf. R.A.E.*, A **34** 282], it was observed that mating occasionally occurred between the two species in nature and that adults of *E. insulana* that emerged during November–February showed marked variations in the colour patterns of the forewings, some of which approached those of *E. fabia*. In laboratory experiments, the results of which are given in detail, some males of either species paired with females of the other, even when females of their own species were available, and under the latter condition, males of both these species also paired with females of *E. cupreoviridis*, Wlk., though males of the latter did not pair with females of either of them. After crossing, females of *E. fabia* and *E. insulana* oviposited, but those of *E. cupreoviridis* did not. The eggs laid by *E. fabia* were not viable, but 34–81 per cent. of those laid by *E. insulana* hatched, and 159 moths, of which 64 were females, were reared. These were kept together, but they neither mated nor oviposited, and it is concluded that the three species are distinct.

KHAN (A. H.). **On the Lantana Bug (*Teleonemia scrupulosa* Stål).**—*Indian J. Ent.* **6** pt. 1–2 pp. 149–161, 6 refs. New Delhi, 1945.

This report on work already noticed [*R.A.E.*, A **33** 264] includes an account of the life-history and habits of *Teleonemia scrupulosa*, Stål, on *Lantana camara* (*aculeata*) in laboratory and field cages at Dehra Dun between February 1942 and April 1943, with details of the feeding of this Tingid and its effect on *Lantana* and other plants, including teak. It is concluded that it might gradually control *Lantana* in the drier parts of India where the winter is mild, provided that large areas of the weed were available, but that it would not be effective in the north, where the winters are too severe, or in the south and south-west, where the rainfall is too heavy, and in view of the danger of injury to teak [*cf. loc. cit.*], it was not liberated.

PRUTHI (H. S.). **Spread of the "Fluted Scale", *Icerya purchasi* Maskell to the Bombay Presidency.**—*Indian J. Ent.* **6** pt. 1–2 p. 163. New Delhi, 1945.

Icerya purchasi, Mask., was found to be common on wattle (*Acacia*) in the Madura and Tinnevelly districts of the Madras Presidency in 1941 [*cf. R.A.E.*, A **33** 384], and a survey begun in August 1943 showed that it was present not only in several further areas in the Presidency and in the States of Travancore and Mysore [*cf.* **33** 391], but also in the Bombay Presidency (Poona); it was observed on several new food-plants, including *Plumbago capensis*, *Kirganelia* sp. and *Cassia didymobotrya*. Its discovery in Poona is of importance to the fruit-growers of northern India, since it readily infests the orchard plants that are grown there.

PADMANABHA AIYAR (K. S.). **Notes on *Laemophloeus* sp. (*minutus*) in stored Flour.**—*Indian J. Ent.* **6** pt. 1–2 pp. 164–165, 3 refs. New Delhi, 1945.

Corn and rice flour sold in bazaars in Trivandrum, Travancore, is often infested by large numbers of *Tribolium castaneum*, Hbst., and occasionally by

much smaller numbers of a species of *Laemophloeus*, all stages of which are described. Observations showed that the eggs of this Cucujid are deposited singly in the flour and hatch in five days. The larvae feed on the flour and pupate in it, and the pupal stage lasts a week. The only natural enemy observed was a mite that attacked the eggs ; it sometimes occurs in enormous numbers, particularly when the moisture content of the flour is high.

PADMANABHA AIYAR (K. S.). *Protrigonia zizanialis* **Swinh. a new Pyralid Pest of** *Moringa pterygosperma*.—*Indian J. Ent.* **6** pt. 1–2 pp. 165–167, 3 refs. New Delhi, 1945.

During the hot months of February–June, *Moringa oleifera* (*pterygosperma*) is attacked in and near Travancore by the larvae of *Protrigonia zizanialis*, Swinh., which occur with those of *Noorda blitealis*, Wlk. [*cf. R.A.E.*, A **28** 560]. The eggs are deposited at night on the lower surfaces of tender leaves, usually in flat masses of up to 53, but sometimes singly, and the larvae mine the leaves during the first instar, but usually web leaves together and feed between them during the later ones. The egg, larval and pupal stages last 3, 11–13 and 7 days, respectively ; pupation takes place between the webbed leaves. The damage caused is similar to that due to *N. blitealis*, and severely attacked trees lose nearly all their leaves. No natural enemies were observed.

All stages of *P. zizanialis* are described, and characters are given distinguishing the larvae and pupae from those of *N. blitealis*.

SLOAN (W. J. S.). **The Control of Tomato Pests.**—*Qd agric. J.* **61** pt. 1 pp. 17–41, 20 figs. Brisbane, 1945.

The information on the bionomics and control of pests of tomato in Queensland given in this revision of an earlier paper [*R.A.E.*, A **30** 497] is substantially unaltered, but the Mirid, *Cyrtopeltis tenuis*, Reut., is included as a pest of the growing shoots, and modifications in some of the recommended control measures are made.

PAPERS NOTICED BY TITLE ONLY.

URQUIJO [LANDALUZE] (P.) & DADIN (J. M.). **Ensayo de los parásitos utiles** *Trichogramma minutum* **y** *T. pretiosum* **en la lucha biológica contra la** *Cydia pomonella*. [An Experiment with the useful Parasites, *T. minutum*, Ril., and *T. pretiosum*, Ril., for the Biological Control of *C. pomonella*, L. (on apple in Spain).]—*Bol. Pat. veg. Ent. agric.* **12** pp. 411–425, 10 figs., 1 fldg. table. Madrid, 1943. [*Cf. R.A.E.*, A **33** 125.]

DEL CAÑIZO (J.). **Notas sobre la " palomilla gris " de la harina** (*Ephestia kuehniella*). [Notes on the Mediterranean Flour Moth, *E. kuehniella*, Zell. (a review of the literature, chiefly on bionomics and control).]—*Bol. Pat. veg. Ent. agric.* **12** pp. 429–435, 7 figs., 9 refs. Madrid, 1943.

GARDNER (J. C. M.). **Immature Stages of Indian Lepidoptera (Cossidae, Indarbelidae** [Metarbelidae]).—*J. Bombay nat. Hist. Soc.* **45** no. 3 pp. 390–396, 1 pl., 2 refs. Bombay, 1945.

MOREAU (R. E.). **Derris Agronomy : an annotated Bibliography and a critical Review. Parts I–III.**—*E. Afr. agric. J.* **10** nos. 2–4 pp. 75–82, 168–176, 243–250. Nairobi, 1944–45.

ROARK (R. C.). **Trade Marked Insecticides containing DDT** [an annotated list].—*Soap* **21** no. 4 pp. 137, 155, 157, 12 refs. New York, N.Y., 1945.